

AUTOMOTIVE *and Aviation* INDUSTRIES

FEBRUARY 15, 1947

Engineering Library



Leadership

Leadership cannot be purchased in the market place. It must be deserved and earned. To hold this place, once it is achieved, means consistent, satisfactory performance.

When automobiles really looked like horseless carriages, and trucks and busses not even a dream, Timken Bearings were favored by the engineers. Year after year as vehicles improved, markets increased, and the infant industry took stature Timken Bearings found even wider acceptance.

Today, few indeed are the cars, trucks or busses which do not include Timken Bearings. They are a part of modern design and assure better performance, longer life and more uniform satisfaction.

Look for them in wheels, pinions, differentials, steering parts and transmissions. Be sure, too, that the trade-mark "TIMKEN" is on every bearing you use.



TIMKEN

TRADE MARK REG. U. S. PAT. OFF.

STEEL ROLLER BEARINGS

THE TIMKEN ROLLER BEARING COMPANY, CANTON 6, OHIO

Increase production
with this
DOUBLE SLIDE
Bore-Matic

Heald No. 42 Bore-Matic provides two-way slide motion at right angles

WHEN YOU'VE GOT a heavy production schedule to meet, here's the machine that can carry a double load. It's the Heald No. 42 Bore-Matic, incorporating two hydraulically-controlled slide movements at right angles.

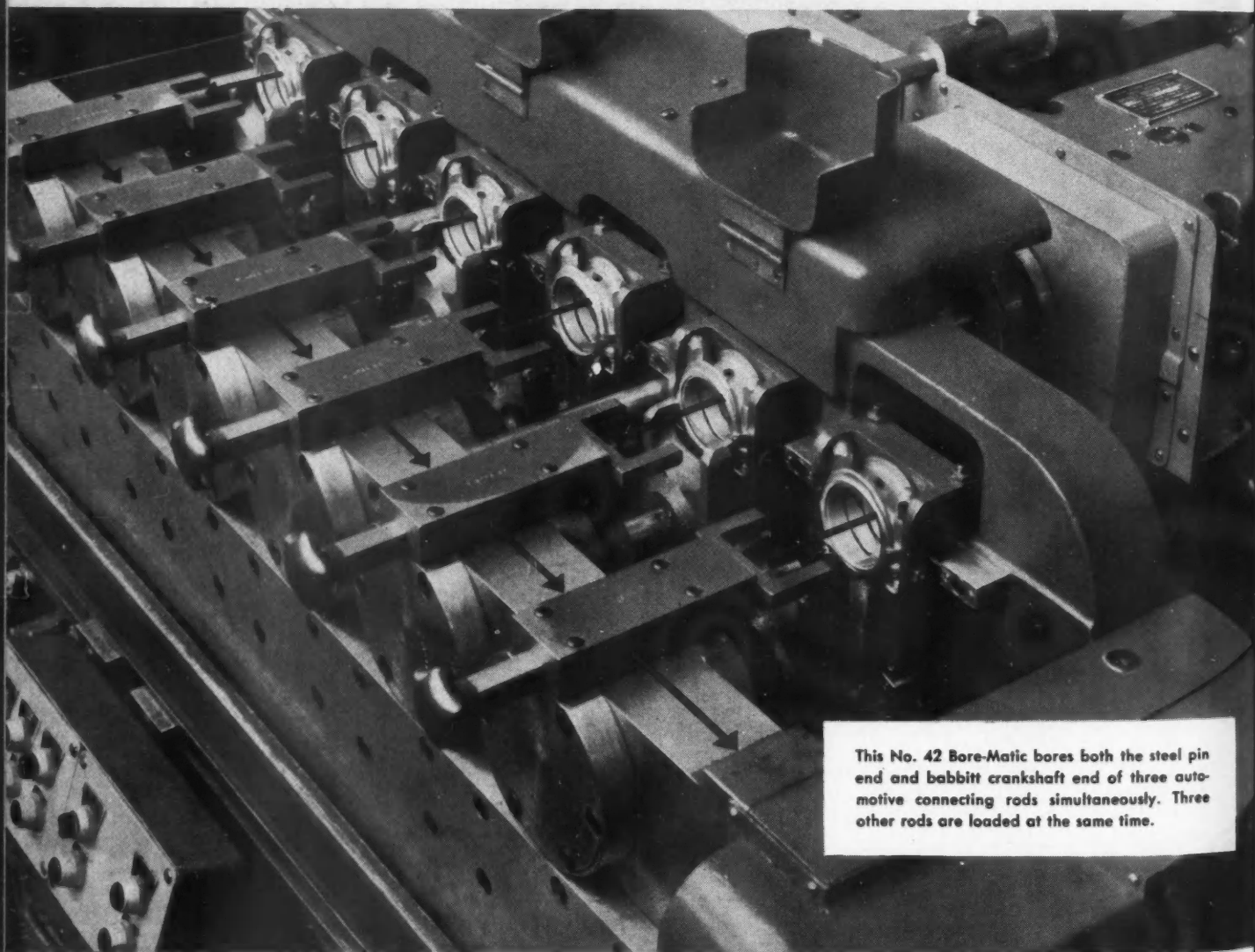
Think how you can speed your work by combining boring, turning, plunge grooving and facing operations on this one machine—in a single automatic cycle. In addition, multiple stations substantially boost production; and simultaneous loading and boring eliminate costly handling time.

The No. 42 Bore-Matic will perform both roughing and finishing operations on a wide variety of parts, such as connecting rods, pistons, pump housings and cylinder sleeves. For further information, get in touch with the Heald branch office nearest you, or write: THE HEALD MACHINE COMPANY, Worcester 6, Mass.

HEALD

*means more precision
... less cost*

Branch Offices at Chicago • Cleveland • Dayton • Detroit • Indianapolis • Lansing • New York



This No. 42 Bore-Matic bores both the steel pin end and babbitt crankshaft end of three automotive connecting rods simultaneously. Three other rods are loaded at the same time.

INTERNAL AND SURFACE GRINDING MACHINES • BORE-MATIC PRECISION FINISHING MACHINES

AUTOMOTIVE and Aviation INDUSTRIES

Published Semi-Monthly

February 15, 1947

Vol. 96, No. 4

JULIAN CHASE, Vice-Pres. and Directing Editor
J. R. CUSTER, Associate Editor
JEROME H. FARRIS, Ass't Editor
MARCUS AINSWORTH, Statistician
JOHN C. HILDRETH, JR., Research
L. W. MOFFETT, Washington Editor
E. J. HARDY, Washington News Ed.
R. RAYMOND KAY, Pacific Coast Editor
JOS. GESCHELIN, Detroit Editor
H. H. ROBERTS, Ass't Editor
ROBERT C. MACK, Ass't Editor
LEONARD WESTRATE, News Editor, Detroit
HOWARD KOHLBRENNER, Art Editor
KARL RANNEIS, Washington News Ed.

CONTENTS

More Car and Truck Plants on the Pacific Coast. By R. Raymond Kay	17
A Pattern for Future Light Car Design	20
Unusual Design Features of the Latest Lagonda	24
Modern Methods Characterize Mass Production in Bendix Brake Plant. By Joseph Geschelin	26
Supersonic Air Age Visualized at Aeronautics Institute Meeting. By Robert C. Mack	31
Airbriefs. By Robert McLaren	32
Specially Designed Machinery Cleans Newly Cast Cylinder Blocks	33
Mass Producing Lightweight Engines at McCulloch's New California Plant	34
Observations. By Joseph Geschelin	38
Novel Outboard Engine Design	39
Automatic Control Meters Fuel in Bendix Direct Injection	40
What's Most Needed to Solve Labor Problems	42
New Production and Plant Equipment	43
Three Minutes Cycle Welding	46
New Pyrometer Uses Silver Shield	46
New Products for Aircraft	47
New Products	48
News of the Industry	52
Calendar of Coming Events	60
Advertisers' Index	146

Copyright 1947 by Chilton Company (Inc.)

G. C. BUZBY, President and Manager Automotive Division
E. H. MILLER, Adv. Mgr. E. W. HEVNER, Cir. Mgr.
REGIONAL BUSINESS MANAGERS
JOHN T. HOOLE, Chicago HARLAND E. BOYD, Cleveland
E. E. ELDER, Detroit A. B. ECKEL, New York
NELSON W. SIEBER, Philadelphia C. H. WOOLLEY, San Francisco
AUGUST HAURIN, JR., Los Angeles

OFFICES

Philadelphia 39, Pa., Chestnut & 56th Sts., Phone SHerwood 7-1424
New York 17, N. Y., 100 East 42nd St., Phone MUrray Hill 5-9600;
Chicago 1, Ill., Room 916, London Guarantee & Accident Building, Phone FRanklin 4243; Detroit 2, Mich., 1015 Stephenson Bldg., Phone MADison 2690; Cleveland 14, Ohio, 1030 Guardian Bldg., Phone CHerry 4188; Washington 4, D. C., 1061 National Press Bldg., Phone DIstrict 8109 and 8110; San Francisco 5, Calif., 605 Market St., Room 608, Phone SUtter 4951; Los Angeles 1, Calif., 6000 Miramonte Blvd., Phone LAfayette 5525;
Cable AddressAutoland, Philadelphia

Member: Audit Bureau of Circulations; Associated Business Papers, Inc.
AUTOMOTIVE and AVIATION INDUSTRIES is a consolidation of the Automobile (monthly) and the Motor Review (weekly), May, 1902; Dealer and Repairman (monthly), October, 1903; the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1918.

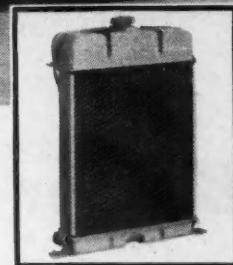
Owned and Published by
CHILTON COMPANY (INC.)
Executive Offices
Chestnut and 56th Streets, Philadelphia 39, Pa., U.S.A.
Officers and Directors
Jos. S. HILDRETH, President
Vice Presidents
EVERIT B. TERHUNE P. M. FAHRENDORF JULIAN CHASE
THOMAS L. KANE G. C. BUZBY CHARLES J. HEALE
WILLIAM A. BARBER, Treasurer JOHN BLAIR MOFFETT, Secretary
HARRY V. DUFFY T. W. LIPPERT FRED V. COLE
WILLIAM H. VALLAR, Asst. Treas.

PAUL WOOTON, Washington Member of the Editorial Board

THE "CROSLEY" IS YOUNG - COOLED



Crosley's 1947 models are cooled by a specially designed Young Radiator with stamped sheet metal construction.



● High production methods have standardized automotive radiators to the point where quality of construction and price are the primary consideration. When a problem like cooling the Crosley car comes along, design also becomes an important factor. Young design, engineering and manufacturing technique are brought out in the completed cooling unit. In the past quarter century Young Heat Transfer Specialists have solved cooling problems for equipment on land, sea, and in the air. Through specialization, Young has gained a worldwide reputation as "Heat Transfer Headquarters." Young offers this background of experience, without obligation. A letter today, outlining your needs, may save costly delays tomorrow.

YOUNG

HEAT TRANSFER PRODUCTS

OIL COOLERS • GAS, GASOLINE, DIESEL ENGINE COOLING RADIATORS • HEAT EXCHANGERS
INTERCOOLERS • EVAPORATIVE COOLERS ENGINE JACKET WATER COOLERS
GAS COOLERS • UNIT HEATERS CONVECTORS • CONDENSERS • AIR
CONDITIONING UNITS • EVAPORATORS HEATING COILS • COOLING COILS
AND A COMPLETE LINE OF AIRCRAFT HEAT TRANSFER EQUIPMENT
YOUNG RADIATOR CO., Dept. 217-B-2, RACINE, WIS., U.S.A.

February 15, 1947

When writing to advertisers please mention AUTOMOTIVE and AVIATION INDUSTRIES

3

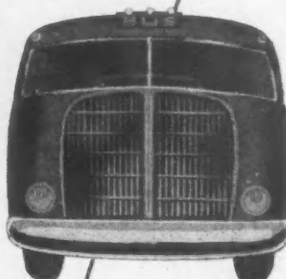
AUTOMOTIVE and AVIATION INDUSTRIES, Vol. 96, No. 4. Published semi-monthly by Chilton Co., Chestnut & 56th Sts., Phila. 39. Entered as Second Class Matter October 1, 1925, at the Post Office at Philadelphia, Pa.; Under the Act of Congress of March 3, 1879. In case of Non-Delivery Return Postage Guaranteed. Subscription price: United States, Mexico, United States Possessions, and all Latin-American countries, \$1.00 per year. Canadian and Foreign \$5.00 per year; single copies, 25 cents, except Statistical Issue (Mar. 15th), 50 cents.



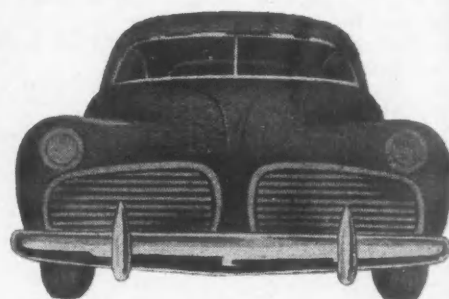
Ever Built

Automotive Vehicles

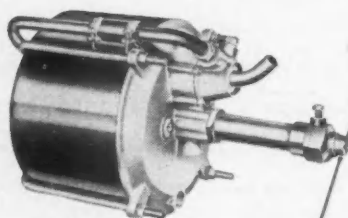
have been



Better Because of



Bendix Engineering



Hydrovac* scores one more engineering "first" for Bendix. Hydrovac combines in one compact unit all the advantages of previous vacuum power braking systems. With three simple tubular connections, it uses engine manifold vacuum to give smooth, positive brake action with a minimum of driver effort. Already the industry acclaims Hydrovac as "1st in power braking."

The dictionary defines engineering as "the science and art of constructing and using machinery." In no other industry has progressive engineering achieved such outstanding results as in the automotive industry. Bendix* has been the partner of this progress for over thirty years, and has always held a prominent place in the vanguard of new engineering development. Tomorrow, as in the past, the industry can confidently expect the *best* from Bendix—First in Creative Engineering.

*REG. U. S. PAT. OFF.

**BENDIX PRODUCTS DIVISION OF
SOUTH BEND 20, IND.**



HYDROVAC* POWER BRAKING

B.K.* VACUUM POWER RELAY VALVES

TRAILER VACUUM POWER BRAKES

HYDRAULIC POWER STEERING

Bendix

**PRODUCTS
DIVISION**

WHEEL BRAKES

CENTERMOUNT PARKING BRAKE

HYDRAULIC REMOTE CONTROLS

UNIVERSAL JOINTS

Some High Spots of this Issue

We'll Have More Car, Truck and Parts Plants in the West

At least so it would seem from what is happening and has happened recently on the Pacific Coast. Decentralization is advancing with increased activity in both complete vehicle and parts manufacture, the latter being stimulated to create more supply sources near at hand. Page 17.

How Light Can a Light Car Be?

That is a question answered convincingly by W. D. Appel now chief engineer, Willys-Overland Motors, and formerly GM light car expert who has studied the subject for more than twenty years in both America and Europe. For one thing he says that a light car is one in which all material has been removed from the wrong places. For other things he says see page 20.

New Ideas in New McCulloch Engines and New Facilities for Their Manufacture

Here is described an interesting development in engine design and manufacture wherein high pressure aluminum alloy die-castings are the chief feature of both design and production. The man responsible is McCulloch of supercharger fame who built light weight engines for the Army and Navy during the war. It begins on page 34.

A New and Unique Car, Typically British in Design

It has a twin camshaft engine with inclined overhead valves, electro-magnetically controlled transmission, torsion bar rear suspension, inboard rear brakes and a cruciform frame. It is described and illustrated in detail beginning on page 24.

What C. E. Wilson Says We Need for Labor Peace

Here are given all ten points of the labor program offered by the president of General Motors among which are: equal rights for employer and employe under the law; definition of the legal scope of collective bargaining; prohibition of union monopoly and the closed shop; elimination of jurisdictional and sympathy strikes, secondary boycotts, feather-bedding, etc. See page 42.

Comprehensive Interpretation of General News Of the Industry Beginning on Page 52

For Complete Table of Contents See Page 3

**AUTOMOTIVE
INDUSTRIES**

Reg. U. S. Pat. Off.

Alloy Quality Doubly Assured



Is this the alloy steel you need? It's A4615 and as with all Ryerson alloys each heat has been carefully selected and thoroughly tested before being placed in stock. It's only one of a wide variety of high quality steels—both prewar and triple alloys—ready for quick shipment from your nearby Ryerson plant.

To give double assurance of high performance, Ryerson supplements quality control with an Alloy Report that accompanies each shipment. The report includes: chemical analysis, results of four separate Jominy Tests, physical properties as interpreted from the test results and recommended working temperatures for every heat of steel in the shipment.

This helpful data is a time-saving guide for heat treaters and provides purchasing men with a complete record in convenient form of

the exact steel received. It's our way of assuring high quality and desired results from every alloy dollar.

The twelve plant Ryerson system has become the nation's most widely used source for alloys from stock. For prompt delivery of steel plus useful guide data, contact the plant nearest you.

ALLOYS IN STOCK

Rounds, Squares, Hexagons, or Flats—Hot Rolled or Cold Finished annealed or heat treated in the following analyses:

AISI 4140	AISI 8650	NCM	} Ni.Cr.Mo.
" 4150	" 8742	NIKROME "M"	
" 4615	" 8750	RY-ALLOY	} Spec.C.Mn.
" 8617	" 9255	RYCO	
" 8620	E 4340	RYARM	
" 8642	E 6150	RYAX	
	NITRALLOY		

JOSEPH T. RYERSON & SON, INC.

Steel-Service Plants: New York, Boston, Philadelphia, Detroit, Cincinnati, Cleveland, Pittsburgh, Buffalo, Chicago, Milwaukee, St. Louis, Los Angeles

RYERSON STEEL

More Car and Truck Plants on the Pacific Coast



First Comprehensive Survey Reveals Many Interesting Facts on Expansion of Automotive Assembly Facilities to Increase Production for Growing Market, on Employment Trend, and on Payrolls. Sizeable Parts Manufacturing Business Established.

By R. Raymond Kay

AUTOMOBILE assembly operations have become an important segment of the industrial life of the Pacific Coast and now make a strong muscle in the area's economic strength.

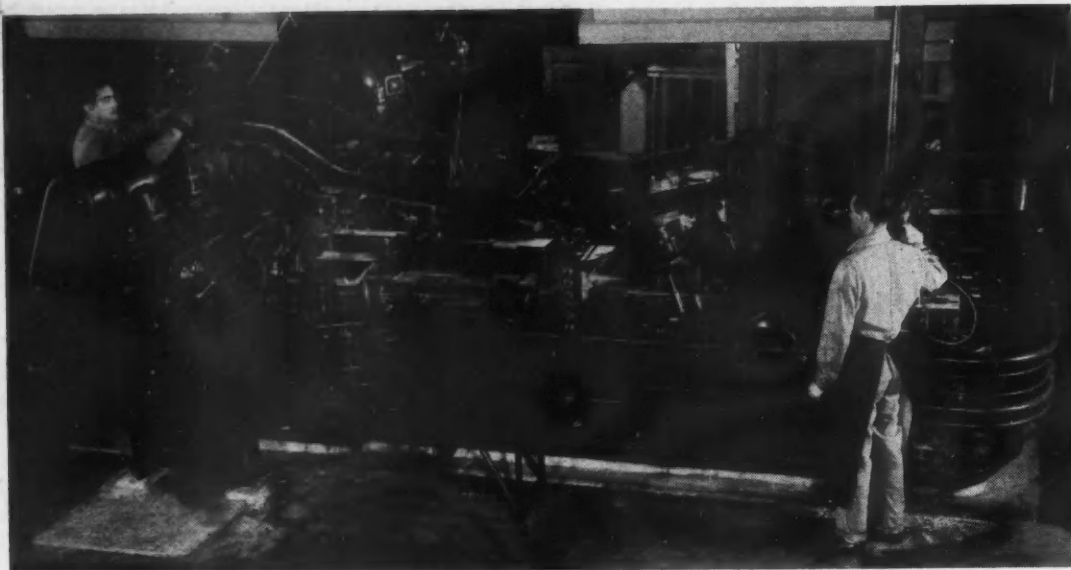
A survey made by this writer indicates that when new plants and enlarged facilities of prewar plants reach full production they will assemble about 700,000 cars and trucks annually compared with a prewar total of 328,000.

Pacific Coast automobile assembly is concentrated in California. Chrysler, Ford, General Motors, and Studebaker operate plants in the Los Angeles area. Ford and General Motors also have plants in the San Francisco Bay area. Passenger cars produced now include Dodge and Plymouth, Chevrolet, Buick, Oldsmobile, Pontiac, Studebaker, Ford and Mercury. Dodge and Ford trucks also are being assembled. Willys-Overland expects to start production in mid-1947.

The augmented facilities now scheduled are four new plants — Chevrolet, Lincoln-Mercury, Kaiser-Frazer, and Nash. When the new plants and the expansions now under construction reach completion, employment in the automobile assembly industry will reach about 17,000, an estimated total for the assembly plants plus the parts manufacturers.

Considering only the assembly plants, the 1941 payroll for 9600 workers was

\$18,900,000. One must keep in mind, though, that 1941 production was pushed to capacity, as the industry realized that it was probably the last peacetime year. In making a prewar-postwar comparison, therefore, 1941 was not a "typical" prewar year on the Pacific Coast. A comparison between 1939 and 1946 would be ideal, but production figures for 1939 are not available. However, the employment and payroll figures for that year make an interesting



Studebaker installed this new frame drilling machine, an operation that results in more accurate fitting of the body, engine and other units on the frame

comparison. In 1939, the total employment was 6300 with a payroll of \$9,577,000, and the comparative figures for 1946 were 11,000 and \$27,700,000, respectively (see Table I).

These figures, of course, give the year's average. But we recall that 1946 production was a long time getting under way due to material shortages and strikes. The picture for the latter part of the year was much brighter than the averages indicate. In December 1946, 13,000 workers averaged \$56.75 in weekly earnings at \$1.40 an hour for an average work week of 40.3 hours.

For a comparative picture of the overall Pacific Coast automobile assembly industry in 1941 and 1946, see Table II. Chrysler's 1946 production figures were not available when this article went to press.

General Motors Expansion

Now, let's take a tour of the assembly plants on the Pacific Coast. General Motors assembly plant operations in California are centered in three Oakland plants and in the South Gate plant (Los Angeles industrial area), with another under construction at

nearby Van Nuys. For many years, the Chevrolet and Fisher body plants in Oakland have been turning out all models of Chevrolet passenger cars and trucks and some models of the GM truck line.

The Oakland assembly plants have approximately 940,000 sq ft of floor space devoted to assembly and allied operations. The major Pacific Coast warehouse for GM parts also is located there. Employment at the Oakland plants on December 31, 1946, was approximately 2700 persons, with the number of 1946 cars and trucks produced, from the start of production earlier in the year to December 31, totaling about 48,000 units. Heading the Oakland assembly operations are F. J. Fitzpatrick, plant manager for Chevrolet, and Charles W. Metcalf, resident manager for Fisher Body.

In Southern California, GM established its first assembly plant at South Gate in 1936 for Buick, Oldsmobile, and Pontiac passenger cars, and Fisher bodies. During 1946 an expansion program was virtually completed, enlarging the production facilities about 50 per cent, and bringing floor space to over one million sq ft. Some 2800 persons were on the plant payrolls as of December 31, with production to that date totaling about 28,000 units of the Buick, Oldsmobile and Pontiac lines. Henry L. Clark is plant manager at South Gate.

Two new wings were added to the South Gate main assembly plant, providing increased and improved facilities for materials handling and assembly operations. A new air-conditioned paint department also was installed. The medical department was enlarged and modernized. The administration building was increased by two new wings, providing additional office space, conference and training rooms, and a cafeteria for office personnel.

GM plants in California pur-

Table I—Pacific Coast Automobile Plant Workers and Earnings

	Estimated No. of Production and Related Workers *	Estimated Annual Payroll (\$000)	Average Weekly Earnings	Average Hourly Earnings	Average Hours Worked Per Week
1939	6,300	\$ 9,577	.....	.....	.....
1941	9,600	18,900	\$39.41	\$1.016	38.8
1946**	11,000	27,700	47.74	1.318	36.1

*—Includes production and related workers in production and other departments, such as shipping, maintenance and warehousing. Does not include administrative, sales, technical, and office personnel, and force-account construction workers. Average weekly and hourly earnings include overtime pay and premium wages for night-shift work: average hours per week are based on part-time as well as full-time workers.

**—Preliminary estimate.

Source: Division of Labor Statistics and Research, Department of Industrial Relations, State of California.

Table II—Pacific Coast Automobile Production, Employment and Plant Size

	PRODUCTION Passenger Cars and Trucks		EMPLOYMENT		PLANT SIZE (sq. ft.)	
	1941	1946	1941	1946	1941 (000)	1946 (000)
Ford	74,000	59,000	2,400	2,700	1,000	1,000
Chrysler	42,000	unavailable	unavailable	unavailable	460	460
General Motors	188,000	76,000	4,900	5,500	1,440	1,940
Studebaker	13,000	400	360	400	320	320
Willys-Overland	11,000	not in operation	450	not in operation	375	375
Totals	328,000	.....	9,600**	11,000**	3,595	4,095

**—Estimated Chrysler employment figures included.
Sources: California Division of Labor Statistics & Research.
U. S. Department of Commerce.
Los Angeles Chamber of Commerce.
California Manufacturers Association.

chase locally tires, bumpers, springs, paints, stores and maintenance materials, supplies and services.

At Van Nuys on a 100-acre industrial site, Chevrolet has completed a parts warehouse, and construction is under way on an assembly plant for passenger cars and trucks. All concrete on or below ground level has been poured, and the first steel recently arrived for the two-story main assembly plant. Construction will be completed during 1947.

(Turn to page 80, please)

(Right) Pacific Coast automobile plants have been equipped with modern facilities for higher production schedules. This photo shows the body drop at the Buick-Oldsmobile-Pontiac at South Gate plant



(Right) Kaiser-Frazer is equipping its Southern California plant to be ready when materials and parts are available. This overhead view of a portion of the body assembly line shows a group of nearly-completed body trucks making a turn in the "body in white" line. In the background can be seen the spray paint booths

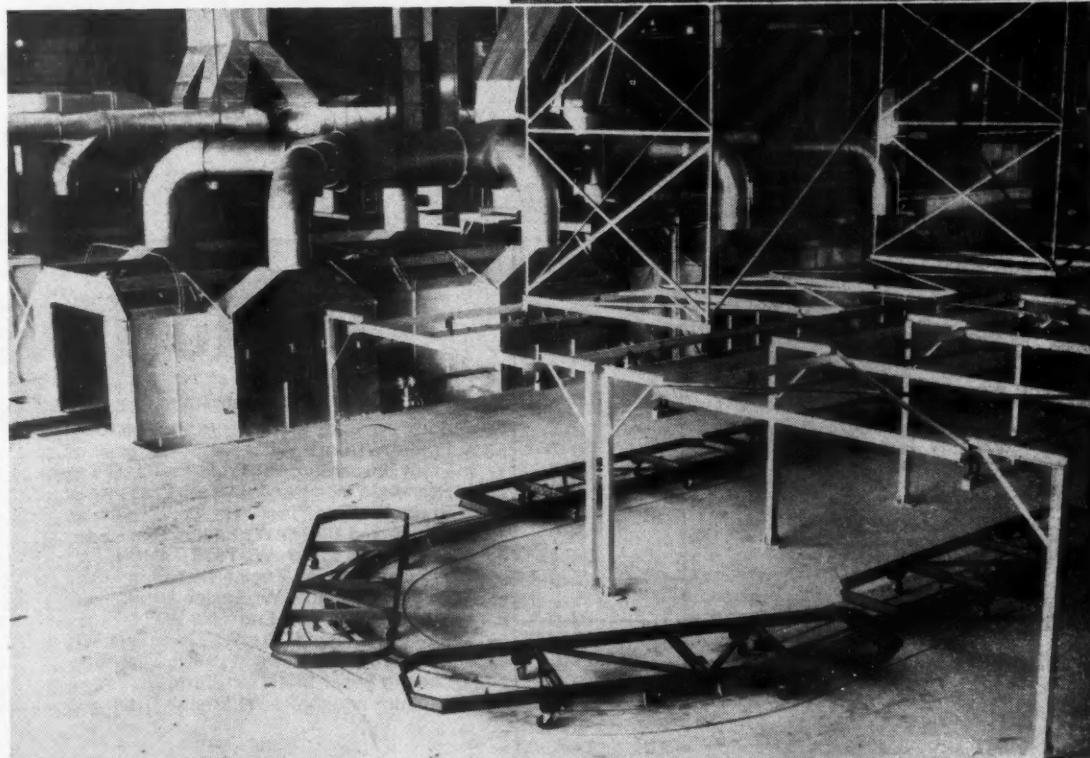


Table I

Functional-group weights of English, German and American cars

	Car A	Car B	Car C	Car D	Car E	Car F	Car G	Car H	Car I
Curb Weight.....	1699.70	1987.84	2034.61	2113.76	2127.65	2310.50	2384.19	2500.37	2524.54
Engine Displacement.....	65.50	72.30	90.80	73.40	88.00	134.20	134.20	108.80	164.30
Wheelbase.....	92.10	92.00	95.70	97.75	97.50	100.00	103.12	105.00	110.00
Tread—Rear.....	46.00	48.50	49.20	49.50	49.00	56.82	58.25	51.00	57.20
Lb Test Wt/Engine Displ.....	32.80	33.70	27.30	34.90	29.30	20.57	21.10	27.10	18.10
Name of Group									
Body.....	554.70	723.66	649.10	817.06	824.32	726.32	724.62	905.92	857.27
Frame.....			54.29	43.25	45.00	123.91	113.00	71.50	119.50
Front Suspension.....	117.30	96.13	95.17	88.42	87.32	103.62	101.50	95.04	127.08
Rear Axle and Suspension.....	180.80	178.51	175.58	152.84	155.45	179.28	175.32	170.84	185.31
Brakes.....	49.60	65.89	99.31	86.80	82.89	76.07	80.18	92.51	72.84
Engine and Clutch.....	328.90	310.18	381.59	334.79	329.93	437.49	427.08	462.85	420.24
Transmission.....	21.50	50.58	44.96	45.34	45.36	37.14	41.04	49.02	45.60
Fuel Tank and Exhaust.....	32.40	32.13	34.93	32.08	32.78	29.31	34.78	41.52	40.52
Steering Mechanism.....	26.00	25.89	26.12	22.12	19.36	24.26	24.87	25.11	24.41
Wheels and Tires.....	163.10	178.38	178.09	167.60	173.43	193.37	199.00	188.10	199.21
Chassis Sheet Metal.....	55.60	101.48	80.11	96.35	96.12	165.22	187.56	107.52	119.81
Electrical System.....	53.20	71.53	59.51	61.61	70.53	61.57	69.38	88.45	69.73
Radiator and Grille.....	25.40	31.05	31.51	43.21	42.37	21.94	42.31	43.84	62.25
Final Assembly Parts.....	27.50	50.44	55.57	58.75	59.47	59.11	70.20	64.69	67.09
Shipping Weight.....	1636.00	1915.84	1965.84	2050.43	2064.32	2238.61	2290.84	2406.91	2410.85
Gasoline, Water and Oil.....	63.70	72.00	68.77	63.33	63.33	71.89	93.35	93.46	113.69
Curb Weight.....	1699.70	1987.84	2034.61	2113.76	2127.65	2310.50	2384.19	2500.37	2524.55
Test Load.....	450.00	450.00	450.00	450.00	450.00	450.00	450.00	450.00	450.00
Test Weight—Total.....	2149.70	2437.84	2484.61	2563.76	2577.65	2760.50	2834.19	2950.37	2974.55
Test Weight—Front Wheels.....	999.85	1143.92	1167.30	1206.88	1213.82	1305.25	1342.09	1400.18	1412.27
Test Weight—Rear Wheels.....	1149.85	1293.92	1317.31	1356.88	1363.82	1455.25	1492.10	1550.19	1562.28

A Pattern for Future

A LIGHTWEIGHT car can be described as one in which all the material has been removed from the wrong place economically, commercially and technically and put into the right place economically, commercially and technically. As an example, high-priced material is in the right place economically if, only through its use, the necessary life-factor or commercial result can be secured. If high-priced materials can be replaced by lower-cost materials, without adversely affecting the result, then high-priced material is in the wrong place economically. Mate-

This article was prepared from the paper, "How Light Is Light in the Passenger Car Field," presented by Mr. Appel at the 1947 SAE Annual Meeting in Detroit.

By Walter D. Appel,

Chief Engineer
Willys-Overland Motors, Inc.

Table II

The ratio of to weights of

Name of Group	Car A	Car B	Car C
Body Wt/Curb Wt.....			31.9
Frame Wt/Curb Wt.....			2.67
Front Suspension Wt/Front End Test Load.....	11.73	8.40	8.15
Rear Axle Wt/Rear End Test Load.....	15.72	13.80	13.33
Brake Wt/Total Test Wt.....	2.31	2.71	4.00
Engine and Clutch Wt/Engine Displ.....	5.01	4.29	4.20
Engine and Clutch Wt/Total Test Wt.....	15.30	12.72	15.36
Transmission Wt/Engine Displ.....	0.328	0.70	0.495
Fuel and Exhaust Wt/Engine Displ.....	0.495	0.444	0.385
Steering Wt/Front End Test Wt.....	2.60	2.26	2.24
Front Wheel and Tire Wt/Front Test Wt.....	6.52	6.24	6.10
Rear Wheel and Tire Wt/Rear Test Wt.....	5.67	5.51	5.41
Chassis Sheet Metal Wt/Curb Wt.....	3.27	5.11	3.94
Radiator and Grille Wt/Engine Displ.....	0.388	0.429	0.347

n cars

Car I

24.54
64.30
10.00
57.20
18.10

57.27

19.50

27.08

85.31

72.84

20.24

45.60

40.52

24.41

99.21

19.81

59.73

52.25

37.09

10.85

13.69

24.55

50.00

74.55

12.27

32.28

Car J	Car K	Car L	Car M
2676.07	3070.18	3129.88	3250.43
150.90	201.30	216.00	216.00
106.10	117.00	113.00	116.00
52.20	60.00	59.00	59.00
20.70	17.50	16.55	17.15

855.42	955.78	965.19	1078.35
71.60	181.00	207.45	210.67
119.69	139.67	139.08	138.93
221.73	239.85	252.33	253.96
105.57	97.73	117.87	119.45
509.83	543.57	575.34	576.01
68.71	65.89	57.28	59.22
56.41	49.30	42.56	41.88
36.67	31.83	33.38	35.44
212.08	213.91	213.66	213.04
118.91	177.83	172.90	156.87
68.41	77.70	83.18	83.96
48.52	64.82	54.69	59.68
77.45	98.07	87.86	95.86

2571.10	2936.95	3002.77	3123.32
104.97	133.23	127.11	127.11

2676.07	3070.18	3129.88	3250.43
450.00	450.00	450.00	450.00

3126.07	3520.18	3579.88	3700.43
1488.03	1685.09	1714.94	1775.21
1638.04	1835.09	1864.94	1925.22

rial is in the right place commercially when it contributes to the sale of the product, and, technically, when it contributes to the successful operation of the mechanism.

Every unnecessary pound of weight represents a burden both in first cost as well as in operating expense. It may be represented by an unnecessary number of cylinders, by luxury gadgets, or by inefficient design. It adds to the weight and cost of the final product; to material transportation cost; and to the vehicle's license or registration fee in many states. If the vehicle is shipped to foreign countries it also adds to the inland and ocean freight, and marine insurance as well as to the duty imposed by the customs offices of many countries.

There is no particular magic about making a car light. This can be done by leaving things off and using thinner sections. The real technique comes in making the car light

and, at the same time, of acceptable appearance with proper performance, satisfactory road handling characteristics and adequate durability.

Car weight is usually spoken of in terms of curb weight. Curb weight is the weight of a complete car with spare tire and tools, and full of gasoline, oil and water, but without passengers. The average low-priced car in the United States in the prewar period had a curb weight of slightly over 3000 lb. The low-priced prewar European car weighed considerably less than 2000 lb.

Table 1 shows 13 English, German and American cars weighing between 1600 and 3300 lb which have been built in volume production.

e Light Car Design

Weight Analysis of Thirteen Passenger Vehicles Shows Relationship Between Weights and Functions of Body and Chassis Units

functional-group weights associated units (in Per Cents)

Car D	Car E	Car F	Car G	Car H	Car I	Car J	Car K	Car L	Car M
38.65	38.74	31.44	30.39	36.23	33.96	31.97	31.13	30.84	33.18
2.04	2.12	4.75	4.75	2.86	4.73	2.78	5.89	6.63	6.46
7.33	7.19	7.94	7.56	6.79	9.00	8.05	8.29	8.11	7.83
11.26	11.40	12.32	11.75	11.02	11.86	13.54	13.07	13.53	13.19
3.39	3.22	2.76	2.83	3.14	2.45	3.38	2.78	3.29	3.23
4.56	3.75	3.26	3.18	4.25	2.56	3.38	2.70	2.66	2.67
13.06	12.80	15.85	15.07	15.69	14.13	16.31	15.44	16.07	15.57
0.618	0.515	0.277	0.306	0.451	0.278	0.455	0.327	0.265	0.274
0.440	0.373	0.218	0.259	0.382	0.247	0.374	0.245	0.197	0.194
1.83	1.59	1.86	1.85	1.79	1.73	2.46	1.89	1.95	2.00
5.55	5.72	5.93	5.93	5.37	5.64	5.70	5.08	4.98	4.80
4.94	5.09	5.32	5.33	4.85	5.10	5.18	4.66	4.58	4.43
4.56	4.52	7.15	7.87	4.30	4.75	4.44	5.79	5.52	4.83
0.589	0.481	0.163	0.315	0.403	0.379	0.322	0.322	0.253	0.276

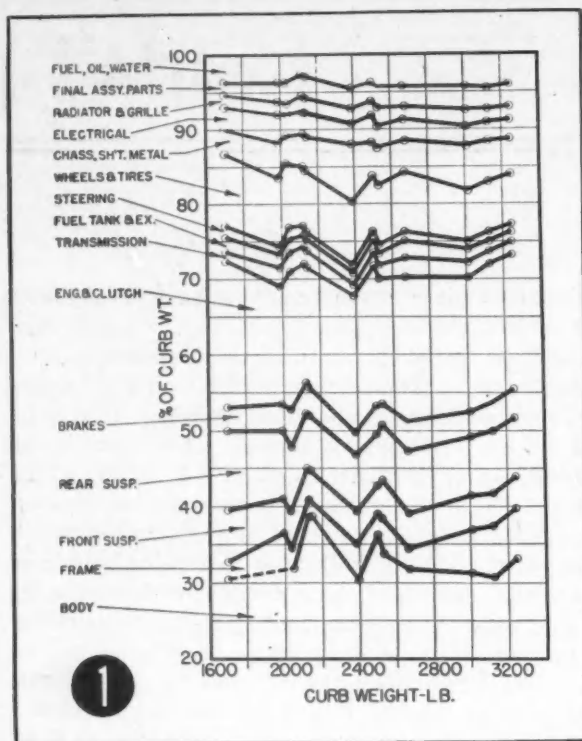


Fig. 1—Percentage weights of the functional groups are plotted additively against the curb weights for the 13 different English, Germany and American cars of Table I, using the curb weight of each vehicle as 100 per cent. The three highest points in the body group at 2113, 2127, and 2500 lb curb weights are English cars in which leather trim, bucket seats, sliding roofs and other equipment add to the body weight

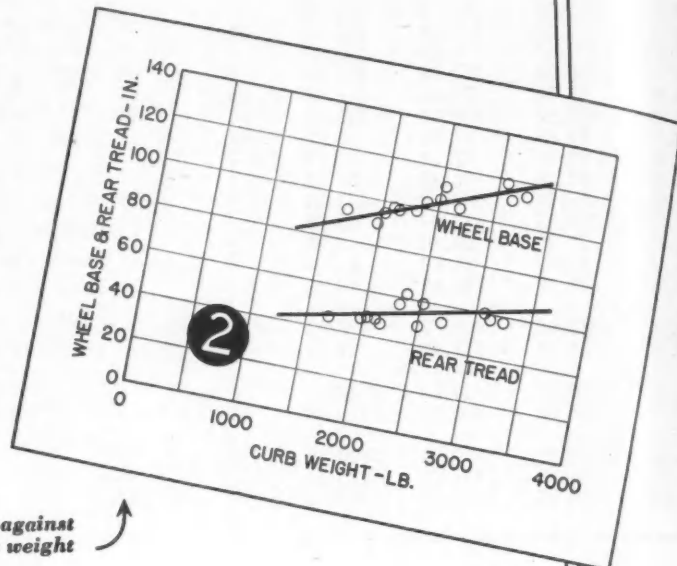


Fig. 2—Wheelbase and rear tread plotted against curb weight, showing the relation of car size to weight

Their curb weight is divided into functional groups of related parts, as shown in the left hand column, for the purpose of comparing the weight of the functional group of one car with that of another. Generally speaking, any functional group of a lighter car will weigh less than the similar group of a heavier car. Yet there are cases where the reverse is true. This indicates either a more severe type of service, with consequently lower stressed materials, or less efficient use of the material. There are numerous examples of this as shown by the chart.

In Fig. 1 the curb weight of each of these vehicles is taken as 100 per cent, and the percentage weights of the various functional groups of each car are plotted additively against the corresponding curb weight. Neglecting fluctuations due to individual design, the group percentage curves are fairly flat and horizontal, indicating that functional groups in the smallest

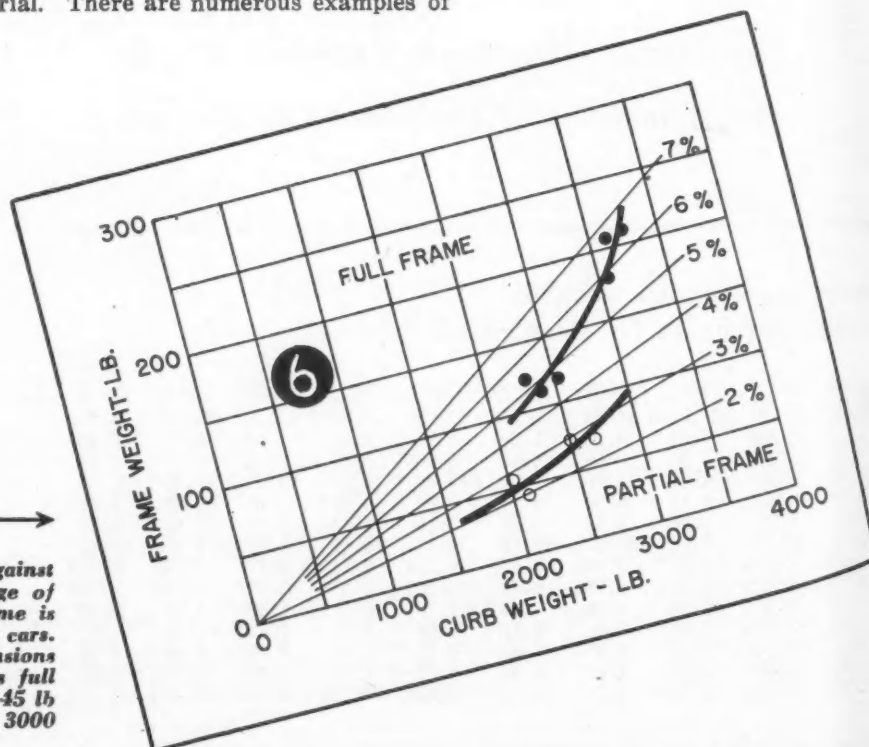


Fig. 6—Frame weight plotted against curb weight shows that percentage of total weight required for the frame is less with lighter than with heavier cars. Partial frames or frame extensions weigh about one-half as much as full frames, amounting to a saving of 45 lb in a 2000 lb car, and 100 lb in a 3000 lb car

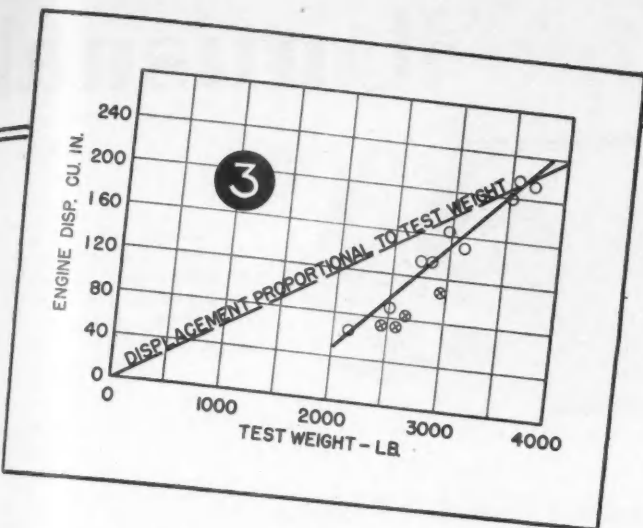


Fig. 3—Curves of engine displacement vs test weight (curb weight plus 450 lb) show a definite relationship between car weight and potential performance. As the car becomes lighter, engine size shrinks faster than car weight, indicating the influence of fuel economy and lower performance in the low-cost vehicle. The four engines marked with crossed circles are of English design where the taxation formula had a further dominating influence in engine size

car utilize about the same percentage of the total weight as on cars weighing nearly twice as much. The two principal exceptions to this are the frame group which increases percentage-wise as cars get heavier, and the wheel and tire group which decreases slightly percentage-wise with increasing car weight.

Table II shows the relationship between the weights of the different groups of these 13 cars and the function that these groups are intended to perform. These tables are not intended as an index for design merit, but rather as a pattern which can be used to judge relative merit. Fig. 2 through 6 show how these functions can be evaluated in greater detail.

Fig. 4—Engine weight per cu in. vs displacement shows hyperbolic relationship, with the upper limit representing heaviest design and the lower limit the lightest. The two engines connected by dotted lines are examples of underboring. In one an 88 cu in. four underbored to 73.4 cu in. increased its specific weight from 3.75 to 4.65 lb per cu in.; and in the other, a 138 cu in. six underbored to 108.8 cu in. increased its specific weight from 3.34 to 4.25 lb per cu in.

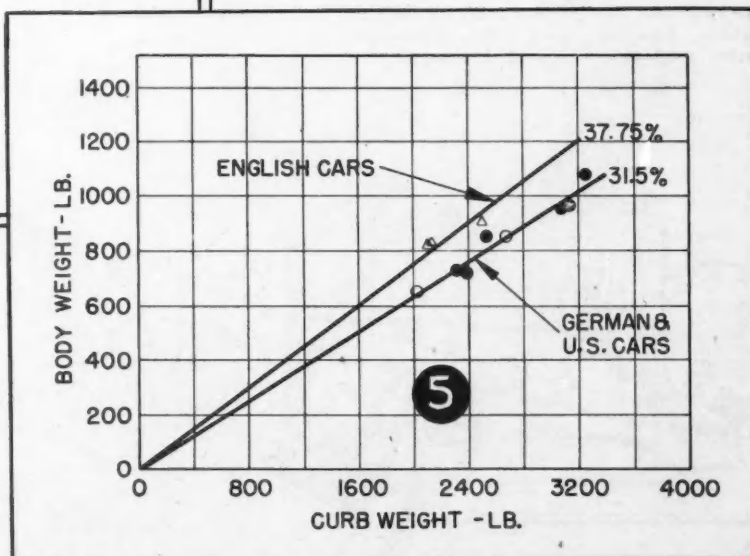
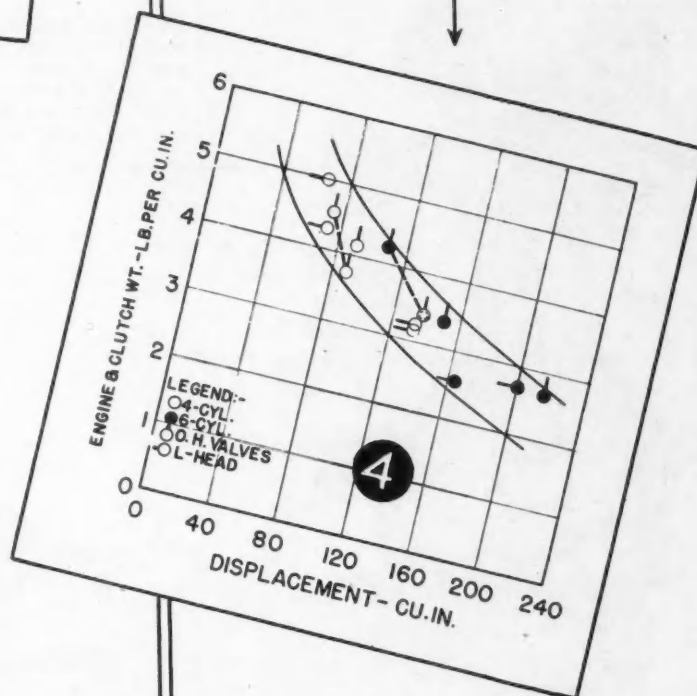
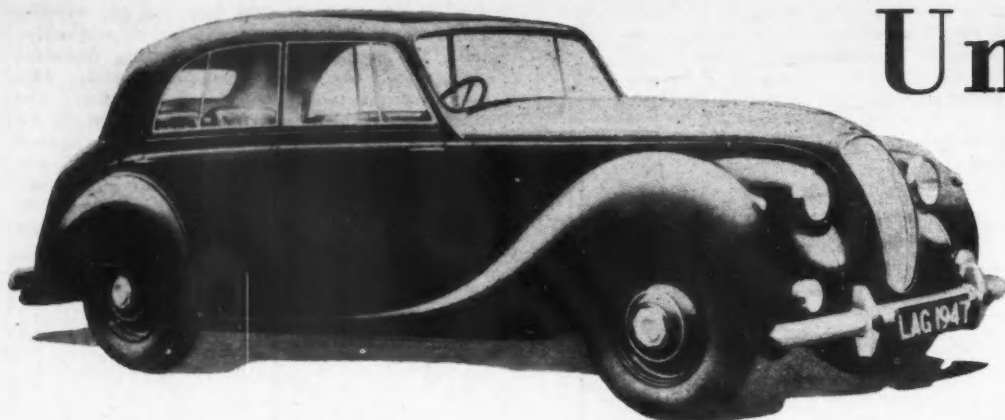
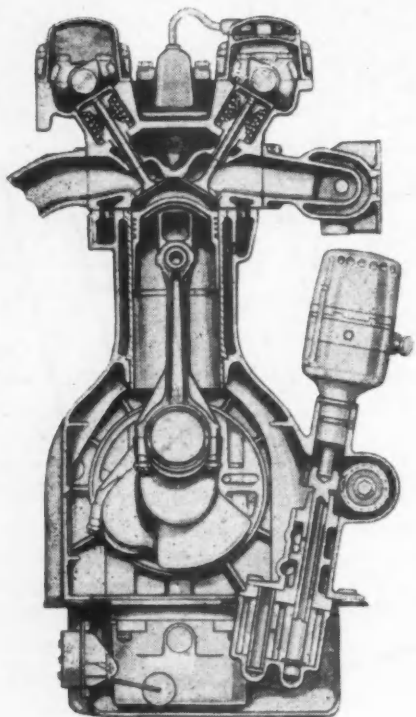


Fig. 5—Curves show how body weight varies with curb weight. The solid black dots represent bodies mounted on conventional frames; hollow circles represent bodies of frameless construction; and triangles show English bodies also of frameless construction. English bodies weigh about 150 lb more than bodies of American design and trim on cars of the same curb weight

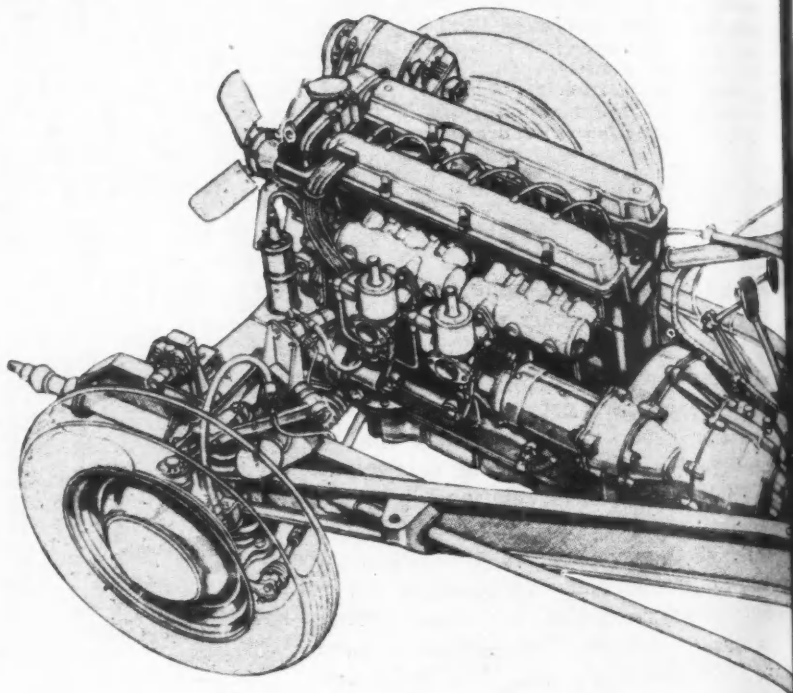


Unusual

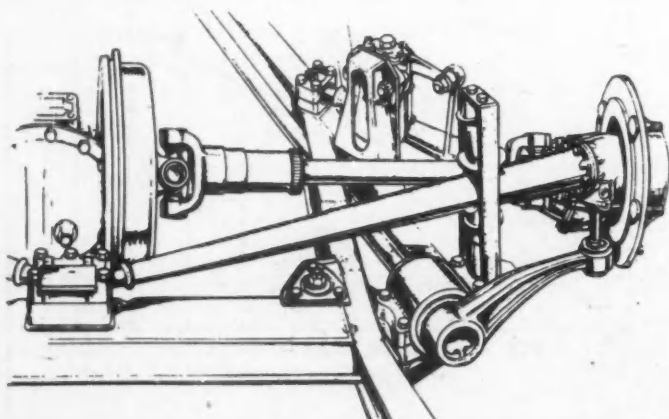
Styling of the 1947 Lagonda four-door sedan provides good driver visibility. Wheelbase is 113.5 in.



The dual overhead camshafts and inclined valves, combustion chamber shape, arrangement of the oil pump and distributor, and the cylinder wet liner are shown clearly in this transverse sectional drawing of the new Lagonda engine. The chain drives from the crankshaft to the camshafts and to the distributor-oil pump driveshaft are shown in the line drawing.



The rear suspension system, viewed from the back, shows the triangulated tubular arms which carry the stub axle; the rear end torsion bar with its bonded rubber bearing, lever and connecting link; and the inboard brake drums.



The chassis frame of the Lagonda consists of diagonal I-beams reinforced at their intersection and at both ends with box-section cross members. Also shown in this drawing is the unusual arrangement of the frame-fixed differential housing and brake drums joined to the stub axles. The longitudinal torsion bars for the rear suspension, located within the channels of the frame rails, are approximately 7/8 in. diameter and 49.5 in. long. The reverse gear is an epicyclic unit located between the rear of the propeller shaft and the hypoid final drive.

Design Features

of the Latest Lagonda

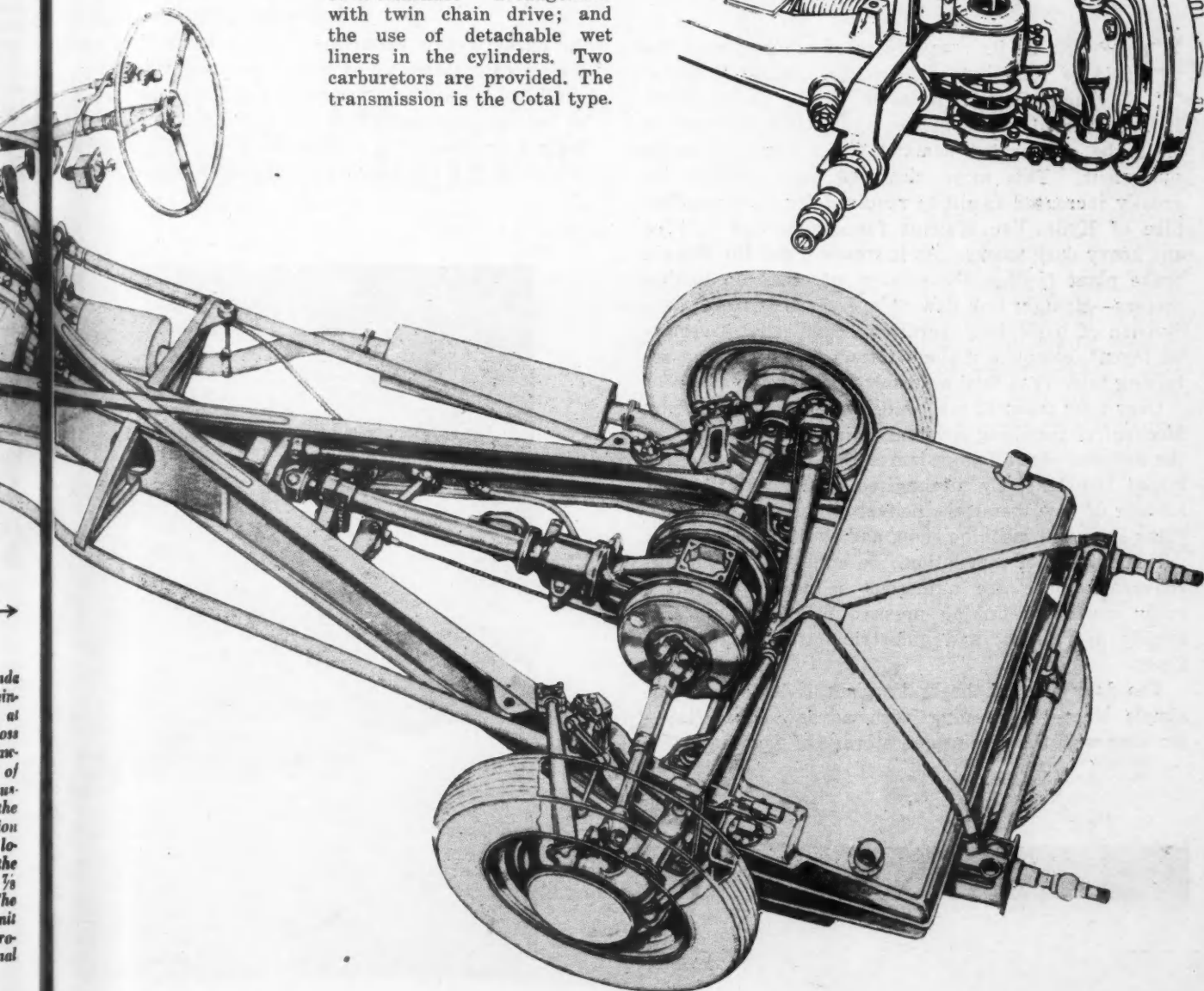
A SPECIAL X-type frame (described in England as the true cruciform type), independent suspension on all wheels with coil springs at the front and torsion bar type at the rear, an automatic centrifugal clutch with a magnetically-controlled epicyclic four-speed transmission, and inboard mounting of the rear brake drums are distinctive features of the new British Lagonda passenger car, details of which are illustrated here by courtesy of *The Autocar* (London).

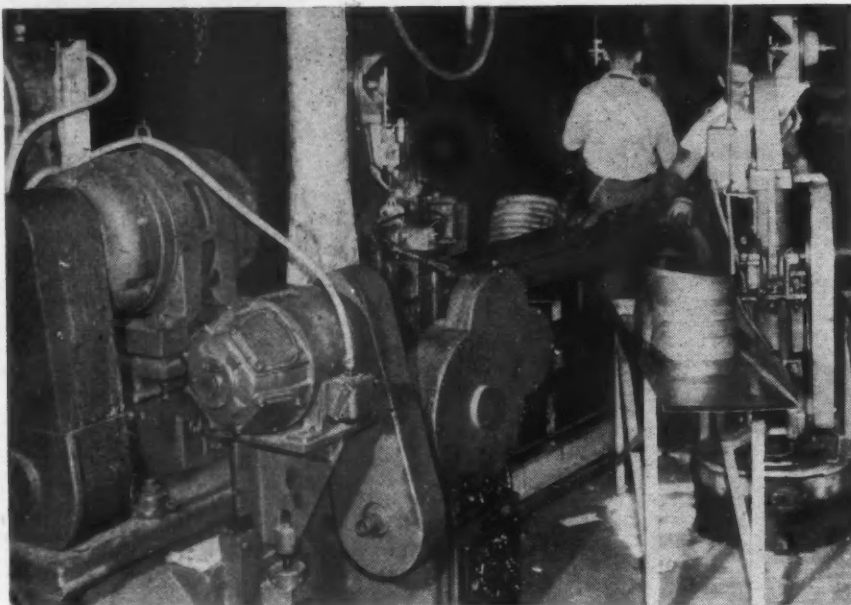
The chassis frame is said to have a torsional resistance 50 per cent higher than many comparable current designs. It weighs 190 lb, and has been torque tested to 2300 lb ft per degree twist. The inboard mounting of the rear brake drums, adjacent to the differential housing, permits a useful reduction in the unsprung weight.

The powerplant is a six-cylinder, overhead valve engine of 157.4 cu in. displacement, with a 3.07 in. bore, 3.54 in. stroke and a compression ratio of 6.5 to 1. The maximum output is 105 bhp at 5000 rpm.

Other engine features include an overhead twin-camshaft arrangement with twin chain drive; and the use of detachable wet liners in the cylinders. Two carburetors are provided. The transmission is the Cotal type.

In the front suspension system, two wishbone links are ball-jointed to the king pins, and a coil spring is interposed between the lower link and the frame bracket. The coil spring is damped by piston-type hydraulic shock absorbers, and steering is through a rack and pinion with twin track rods pivoted on the center line of the frame. The forward extension from the frame is a jacking point.





Close-up of the new Gardner grinder for truing linings after assembly to shoes. This is an automatic operation, parts being fed to the work head in the chute shown at the right.

PROFITING by its many years of experience in the field of volume production, the Bendix Products Division, Bendix Aviation Corp., South Bend, Ind., converted its facilities right after the war to meet the accelerated demand for automotive brake equipment. This move also took into account the greatly increased facilities required for the manufacture of Hydro-Vac systems for commercial vehicles and heavy duty trucks. As it stands today the Bendix brake plant typifies the concept of mass production process—straight line flow of operations, careful subdivision of individual operations, compact departmental layout, complete mechanization, and ingenious revolving table type final assembly stations.

Over four miles of monorail conveyors, installed by Mechanical Handling Systems, constitute the heart of the materials handling system in this plant. The entire layout is extensively mechanized to facilitate the unloading of raw materials, delivery of materials to the press shop and machine shop, and the flow of parts in various stages of completion. In addition to monorail conveyors there are numerous sections of gravity roller conveyors linking presses, machines, and assembly operations; and industrial trucks of various types.

The floor plan of the brake plant is laid out along simple lines—in keeping with advanced practice—starting with the receipt and storage of raw materials

at one end, flowing through the press bays, process departments, assembly stations, and finally to the packing and shipping departments in the rear. Raw materials in the form of steel strip in rolls and bundles come in by rail and truck and are unloaded by means of two cranes, one of 10-ton, the other of five-ton capacity. Smaller loads are handled by lift trucks. The same equipment is used to deliver steel to the press bays.

Press lines, starting at this point, run in parallel bays—one for brake shoe stampings, the other for backing plates. Further down the line the press shop fans out to the right of

the backing plate department into a large sized press shop for the stamping of miscellaneous small parts.

While the skillful arrangement of the press shop can be better visualized from the description of some of the major stampings operations, it may be noted at this point that the layout consists of groups of presses



By Joseph Geschelin

Modern Methods Characterize Mass Production in Bendix Brake Plant

tooled for each of the variety of parts required for the extensive line of brake assemblies. Depending upon volume, some of the presses are simply tooled for hand feed operation while others exhibit the latest features in high production automatic operation.

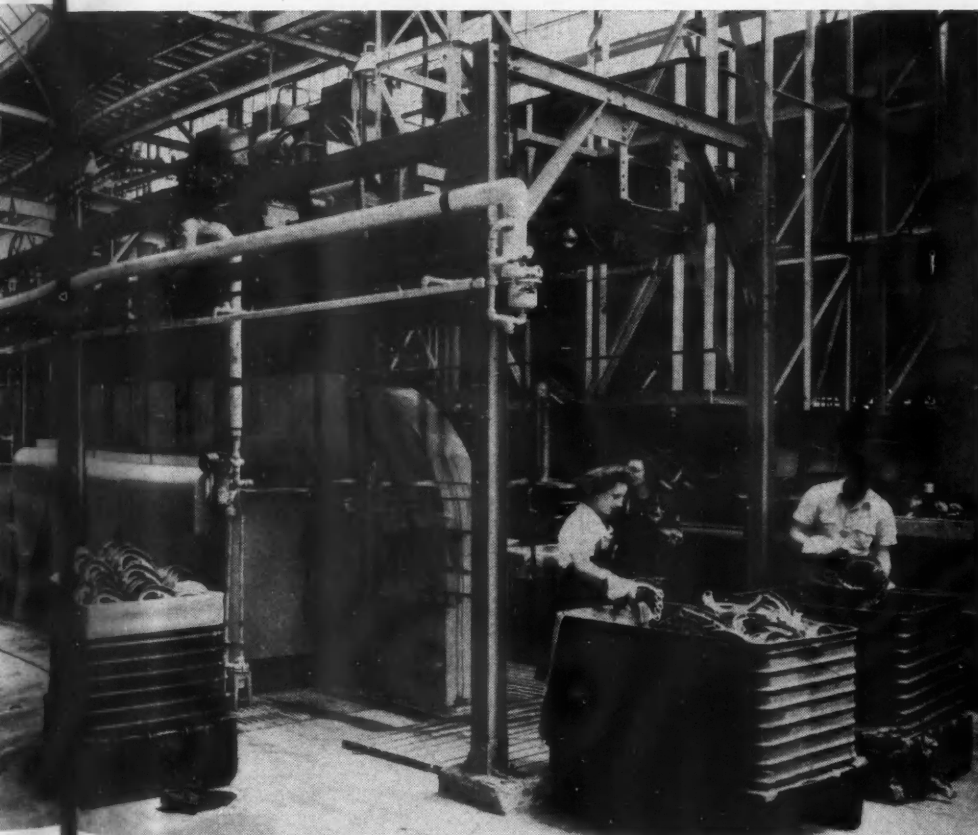
In the past year or so the Hydro-Vac brake system for commercial vehicles has become a major activity in the brake department. Fabrication and assembly facilities are concentrated at the extreme end of the brake building while die castings for some of the major parts are produced in the die casting department in Plant 2. Although Hydro-Vac assembly embodies many interesting operations, we shall confine ourselves to a description of a few of the main parts at this writing. The story cannot be told completely at this time as the production department is now working on plans for installing rotary table assembly conveyors similar in principle to those used for brake assembly.

Bendix is producing brakes for most of the major passenger car and truck manufacturers, and to handle this variety parts for each type they are carefully scheduled to a group of

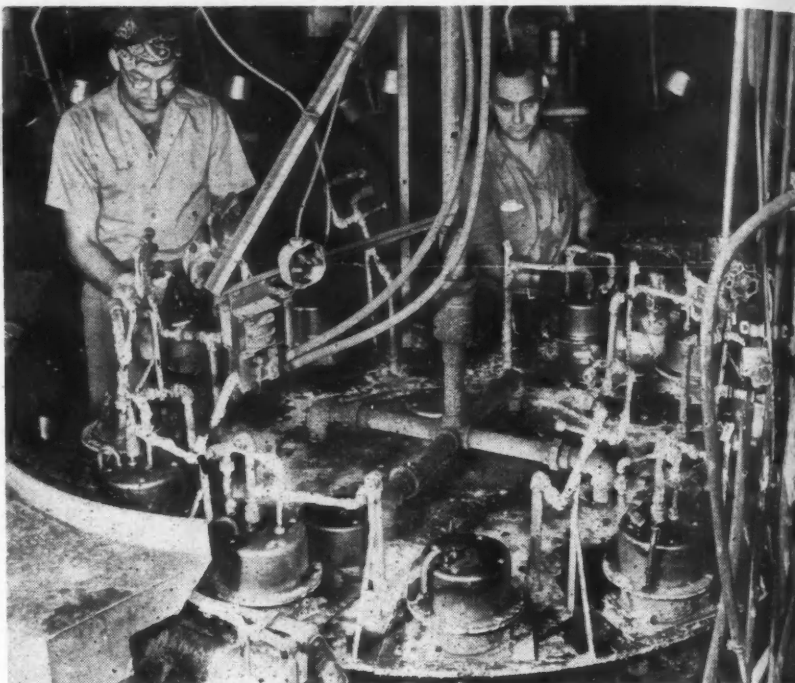
presses and other fabricating equipment to achieve uniform flow in the quantities required for the assembly stations. These parts converge for washing and welding and electroplating, then are scheduled for lining assembly and finally to the rotary assembly stations.

To give the best picture of the process we have selected one of the high production brake assemblies for discussion. The shoe assembly consists of three parts—the rim, the web,

Perspective of the large Hanson - Van Winkle - Munning semi-automatic plating conveyor for plating brake shoes as described in the text.



Brazing of cylinder shells is done on this rotary table machine which is tended by two operators.



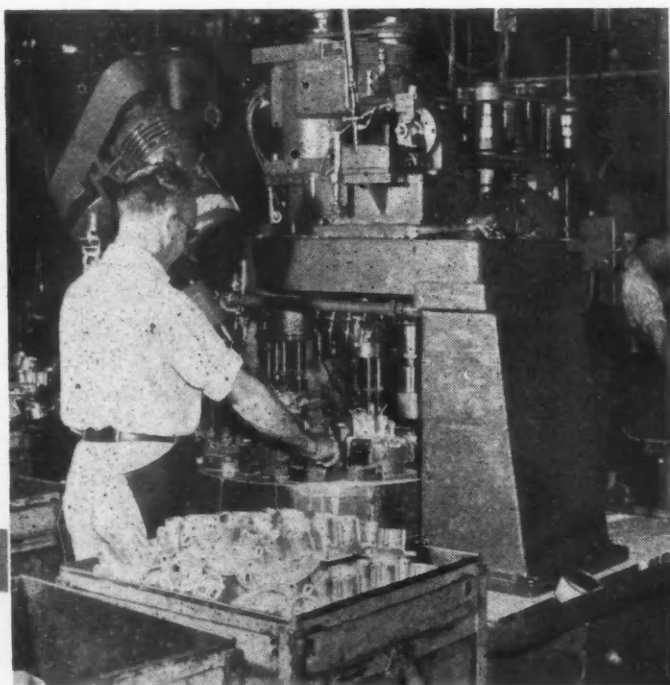
and the lining. The rim is made from SAE 1010 HR coil stock, pickled and oiled, which is delivered to the first operation press for piercing, embossing, and blanking. This is a new No. 6200 Bliss press with progressive punch and die tooling. At the loading end, the press is served by a Littell cradle reel feeding stock through a Littell continuous straightening machine. The operation is fully automatic.

The blanks are inspected, then move to the Blakeslee washing machine. The brake shoe web, a contoured stamping, is made from SAE 1020 HR pickled strip steel, planked and pierced by continuous feed in a No. 279 Hamilton press. Web blanks are inspected, washed in the Blakeslee washer and moved to stores ready for assembling the shoe.

Next is the brake shoe sub-assembly. This is done in specially designed 250-kva flash welders, of which they have a large battery. The welding station of these machines has a revolving drum type fixture into which are inserted several web blanks before starting

the operation. Above the fixture is a magazine containing a stack of flat rim blanks, fed one at a time. As the blank is fed into position, it is rolled into form over the drum and welded securely to the web. At the completion of the cycle, the operator removes an assembly consisting of the rim and web.

Next the parts go to a 600-ton Cleveland press for coining both ends of the web and stenciling at the same time. Then the work is coined to produce a true radius of the rim in a new Cincinnati Rigid-Press fitted with upper and lower restrike dies. A group of P-3 Ferracute presses is used for the rough shaving of the brake cylinder hole, trimming of both ends, and piercing the anchor hole in one setting; followed by the finish shaving of the cylinder hole in another press. The sub-assembly is inspected and transported to the large mechanized Hanson-Van Winkle-Munning semi-automatic electroplating machine for producing the long-lived protective coating of zinc plate and



Among the special equipment in the Hydro-Vac machine shop is this special Rehnberg-Jacobson drilling and tapping machine on end plates. Several of these machines are found in this department.

dichromate dip. This unit, capable of finishing 3400 pieces per hour, has the following sequence of operations: 1. Reversed current—alkali cleaner; 2. Cold water rinse; 3. Reversed current—sulfuric acid pickle 15 per cent; 4. Cold water rinse; 5. Reversed current—alkali cleaner; 6. Cold water rinse; 7. Hydrochloric sharp dip—room temperature; 8. Cold water rinse; 9. Neutralizer—sodium hydroxide; 10. Zinc plate; 11.

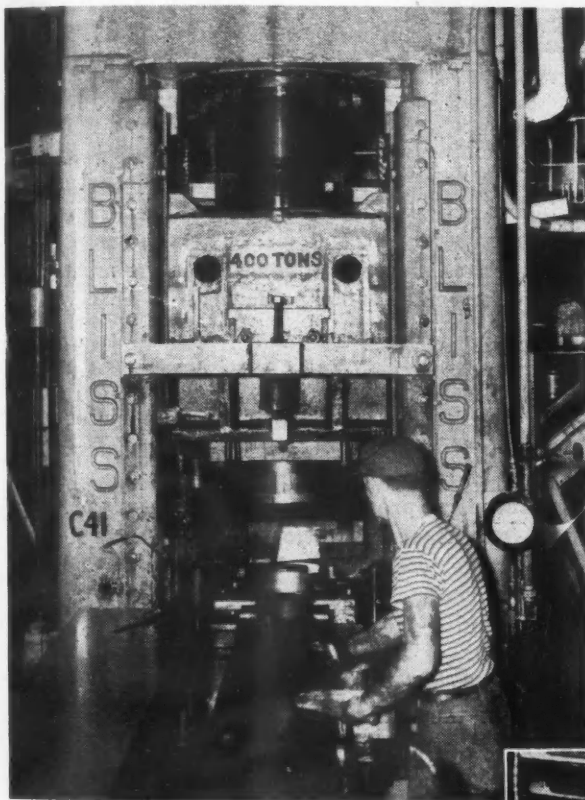
Cold water rinse; 12. Cold water rinse; 13. Dichromate dip; 14. Cold water rinse; 15. Warm water rinse; 16. Air dry.

The scene shifts to the lining department where the linings are machined, riveted to the shoe, and ground to exact form. Molded linings are received from an outside plant, inspected for thickness and contour. Both ends of the lining are "ramped" or chamfered in a Besley grinder, then the 10 rivet holes are drilled and chamfered in one setting in a familiar Kingsbury multiple-head drilling machine. Linings are given final inspection and are ready for assembly to the shoes. This is done by riveting in Chicago automatic riveters provided with magazine feed for the rivets.

After riveting, the sub-assembly goes to a newly installed Gardner automatic grinder of advanced type. As illustrated, this machine is equipped with a long double chute conveyor into which the shoes are loaded. Work enters the grinding station two shoes at a time, is automatically clamped, ground, and ejected into the return side of the chute conveyor for transport to the inspection station at the other end. Inspected sub-assemblies then are hung on the monorail conveyor for transport to the assembly department.

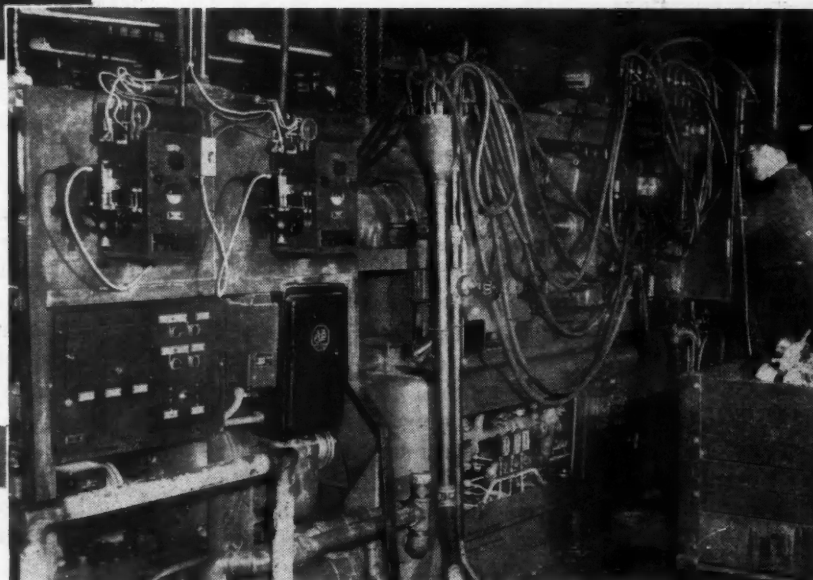
Meanwhile, backing plates are produced in a steady flow in the adjacent press department as mentioned earlier. Raw material for this purpose is SAE 1010 HR strip stock, pickled and oiled, and of extra deep drawing quality. Blanking and first forming is done in a No. 309 Bliss press fitted with a combination blanking and drawing die. Finish forming is handled in a No. 59 Toledo press, followed by trimming of OD in a No. 309 Bliss press. Then follow the edging and finish coining of shoe pads in a No. 514 Toledo press, the piercing of all holes except cylinder mounting hole in a No. 57 Toledo press. The cylinder mounting hole is pierced in a No. 57 Ferracute press.

An interesting feature in this department is the system of linking the successive press operations with short sections of gravity roller conveyors. This eliminates manual handling and greatly facilitates high



(Above) Close-up of one of the Bliss Hydro-Dynamic presses in the line producing Hydro-Vac shells. This unit is of 400-ton capacity.

(Right) View in die casting department—new Lester Phoenix die casting machine produces castings for Hydro-Vac units.





Welding of small parts onto brake dust guards is handled here, the rotary table being indexed under the work head of the welder in the background.

speed operation in an important production step.

Upon completion of press operations and inspection, the backing plates are cleaned in a Blakeslee washer and travel on the monorail conveyor through a black enamel dip unit. Moving on the conveyor, the backing plates go through a long baking station formed by an enveloping bank of infra-red lamps which dries the enamel almost instantly.

At this point the various components are converging on the conveyors to the final assembly stations ready for building brake assemblies. The assembly department occupies two long parallel bays, one containing eight rotary assembly tables—the other, with four rotary tables and six assembly benches, the latter for special and low production jobs. The assembly department is traversed by monorail feeder lines carrying shoe assemblies, backing plates, and other parts. Using a device developed at Bendix many years ago, each of the conveyor hooks is painted in a color to designate the type of shoe for ready identification by assembly operators.

Depending upon the size and type of brake assembly, each assembly table is arranged to handle one or two different makes according to schedule. Each revolving table is served by two sub-assembly benches. The first one, handling backing plate sub-assemblies, feeds work to the rotary table on a gravity roller conveyor; the other, for the assembly of small parts, feeds to the table through a chute. The tables are fitted with metal compartments for storing washers, bolts, springs, and other miscellaneous parts so arranged as to be within easy reach of the operator. As the brake assembly is completed it is pushed onto the gravity roller conveyor to the right of the table and moves to the final inspection bench. Immediately following inspection the brake assemblies are hung on a monorail conveyor which carries them to the packing and shipping department directly in the rear end of the assembly department.

It may be mentioned at this point that master cylin-

ders and wheel cylinders are prepared for the assembly line in a special self-contained department nearby. This department receives component parts from the machine shop and assembles on revolving tables similar to the ones in the brake department. The cylinders are tested with fluid to simulate operating conditions before acceptance. Then the inspected cylinders are transported by monorail to the assembly department for installation in the brakes.

Hydro-Vac Department

As mentioned earlier, the Hydro-Vac brake system for commercial vehicles and trucks has become one of the major activities at Bendix. Demand has increased so greatly as to make it feasible to re-arrange the department for mass production, utilizing the revolving table type final assembly station which has worked so well in the brake department. For our purpose at this time, we shall confine the discussion to three principal parts of the unit—the cylinder shell, valve body, and end plate.

As illustrated, cylinder shells are produced in a press department at the extreme end of the backing plate press bay, featuring a group of new Bliss hydraulic presses of advanced type. The material is SAE 1010 cold drawn strip steel of extra deep drawing quality. Blanking and drawing is done in a single operation in a 400-ton Bliss Hydro-Dynamic press. The blank is trimmed in a No. 48-S Bliss press equipped with a Brehm type trim die. Final operation is the piercing of one hole, and embossing in a 150-ton Bliss hydraulic press. The shells are hung on a monorail conveyor for transport through the Detrex vapor degreaser.

After degreasing the shells are transported to the process department for brazing a tube in the pierced hole and a stud in the embossed depression. Brazing is done quite simply on a unique multiple station rotary table designed and built here. Each station of the table has a fixed set of gas burners fitted to the fixture, and a set of hinged burners overhead. Two operators are required to maintain the cycle. One loads and unloads the shells, the other fits the stud and

(Turn to page 74, please)

Supersonic Air Age Visualized

IAS Officers for 1947

PRESIDENT—Preston R. Bassett

VICE PRESIDENTS—Luis De Florez, Rear Admiral, USNR, Aviation Representative to Naval Research Advisory Committee; John K. Northrop, president of Northrop Aircraft Inc.; Wellwood E. Beall, vice president, engineering and sales, Boeing Aircraft Co.; and Rex B. Beisel, vice president, United Aircraft Corp., and general manager, Chance Vought, Aircraft Div.

EXECUTIVE VICE PRESIDENT—Bennett H. Horschler

DIRECTOR—S. Paul Johnston

TREASURER—Burdette S. Wright, vice president of Curtiss Wright Corp.

SECRETARY—Robert R. Dexter

CONTROLLER—Joseph J. Maitan

at Aeronautic Institute Meeting

By Robert C. Mack

of this year's meeting were the Army, Navy and Civil Aeronautics Administration Day luncheons at which Major General L. C. Craigie, Engineering Division Chief of the Wright Field Air Materiel Command; Rear Admiral L. C. Stevens, Assistant Chief for Research and Development, Bureau of Aeronautics; and William A. M. Burden, Assistant Secretary of Commerce, spoke on aviation topics related to their respective organizations.

Papers presented at the aircraft propulsion session were confined exclusively to jet and rocket propulsion problems, reflecting the trend of research towards extreme speeds. In their paper, "A Survey of the Calculated Performance of Jet Power Plants," J. H. Keenan and Joseph Kaye compared the efficiency of moving powerplants with stationary ones by a study of the effect of certain variables: pressure ratio, speed, maximum temperature and diffuser efficiency. Concerned also with jet propulsion performance, Benjamin Pinkel and I. M. Karp, Cleveland Laboratory, NACA, presented charts for computing the thrust, fuel consumption, and other performance values of a turbo-jet engine for any given set of operating conditions and component efficiencies. It was shown that, although thrust per unit mass rate of air flow increases with increased combustion discharge temperature, for minimum specific fuel consumption an optimum combustion outlet temperature exists which in some cases may be less than the limiting temperature imposed by strength-temperature characteristics of present materials. W. C. Roberts, Bell Aircraft Corp., in his paper, "Selection and Design of Rocket Power Plants," covered rocket propellants, fuel systems, and motor design.

At the rotating-wing aircraft session, held jointly
(Turn to page 72, please)

PEERING into the new air age of supersonic speeds through rocket and jet propulsion, the 15th annual meeting of the Institute of Aeronautical Sciences, held in New York City during the last week of January, was highlighted by technical discussions on the design, structure, aerodynamics and propulsion of bodies at extreme speeds. The meeting opened with the Honors Night Dinner when more than 1000 scientists and aviation specialists, a record attendance, assembled for an address by the Secretary of Commerce, W. Averell Harriman, on "Civil Aviation — A New Economic Frontier," which was followed by the presentation of honors and awards to men who have made outstanding contributions to the advancement of aeronautics. These award winners are presented at the end of this article.

At the following three-day technical sessions, 35 papers were given on such subjects as rocket and jet propulsion, helicopters, guided missiles, weather control, and aircraft fire protection. An added feature

Airbriefs

by Robert McLarren

Air Safety

With casualties soaring towards the 1000 mark in air crashes this winter, the pressing need for precision all-weather landing aids has been brought into sharp focus by a Congressional investigation. The controversy revolves around the respective merits of the Ground Control Approach (GCA) system and the Instrument Landing System (ILS). The problem, however, includes many other factors beside the technical merits of the two systems including the availability of funds, pilot preference, existing investments and rapidity with which equipment can be installed.

ILS System

The Instrument Landing system of the Civil Aeronautics Administration is the culmination of research and experiment which began in 1928 with development of a practical "blind landing" system by Harry Diamond and F. W. Dunmore of the U. S. Bureau of Standards. This basic system has been continually improved at considerable expense in the ensuing years until it was pronounced satisfactory and plans prepared for its installation throughout the U. S. This, however, was 1940 and the war forced CAA to delay its procurement of equipment. The system is automatic in operation and is executed by the pilot of the airplane. It consists, essentially, of a directional beam sloping upward from the runway to an altitude of 1500 ft about 5 miles from the airport.

In addition, an outer and an inner marker beacon project a beam vertically, the former about $3\frac{1}{2}$ miles from the runway and the latter about one-half mile from the runway. The pilot intersects the glide path five miles out and a pair of crossed pointers on the instrument panel indicate his position laterally and vertically with respect to the beam. As long as the pointers remained crossed his glide is being made correctly. As the outer marker is passed, a purple light indicates the fact on the instrument panel and a distinctive tone is heard in the pilot's earphones. The inner marker energizes an amber light on the panel

and another distinctive tone indicates the fact to the pilot. These two markers provide longitudinal guidance. After passing the inner marker, the pilot continues his glide, keeping the pointers crossed until the wheels touch the ground.

GCA System

This Ground Control Approach system utilizes war-developed radar as its basic element and for its development Dr. Luis W. Alvarez was awarded the Collier Trophy. It moves direction of the airplane approach from the cockpit to a ground station. It consists, essentially, of a ground radar station which "picks up" the airplane in its scope from a distance of about 30 miles and the ground operator tells the pilot the course, speed and altitude to fly to approach the runway. At a distance of about 10 miles a more precise radar scope "takes over" and the ground operator "talks" the pilot down onto the runway by giving directions as to lateral and vertical position and his exact longitudinal distance from the runway. The accuracy of GCA seems a near-miracle with endness stories of planes actually taxiing up to hangers in pea-soup fog and the crew climbing out and walking into the hanger a dozen feet away without ever having seen it! Your AIR-BRIEFS reporter landed GCA in a demonstration flight two weeks ago and was astonished, as all others have been, at the accuracy of the method. Although accomplished in clear weather, the pilot's cabin was "blacked out" by polarized covering over the windshield and polarized goggles, the combination creating complete invisibility.

Respective Merits

The pros and cons of the two systems are numerous and the most logical solution seems to be a combination of both ILS and GCA at major airports. The ILS systems requires a glide path receiver and a marker beacon receiver in the airplane; the GCA system requires only a conventional voice receiver. The GCA system required three ground operators with suitable skill and training during the war, a master

controller, a radar operator for vertical and lateral position and a radar operator for longitudinal position, both of which fed information to the master controller who "talked" to the pilot. A new system, recently perfected by Gilfillan Brothers of Los Angeles has combined the three jobs into a one-man system. The ILS system does not require an operator on the ground. GCA transfers control and responsibility for the airplane from the pilot to the ground; ILS enables the pilot to retain direction of the plane in accordance with his heavy responsibility for the safety and comfort of the passengers. GCA is considerably more expensive than ILS but it may be moved quickly from one runway to another as the prevailing wind changes, the entire equipment being mounted in a mobile truck.

Complementary Aids

Other all-weather landing aids are being urged. The wartime and subsequent peacetime experiments and use of FIDO fog dispelling equipment has proved its effectiveness. This system involves the burning of fuel in ditches along either side of the runway, the heat and attendant convection dispelling the fog from the runway and surrounding area. High-intensity approach and runway lighting have also been studied and suitable lamps developed for the purpose.

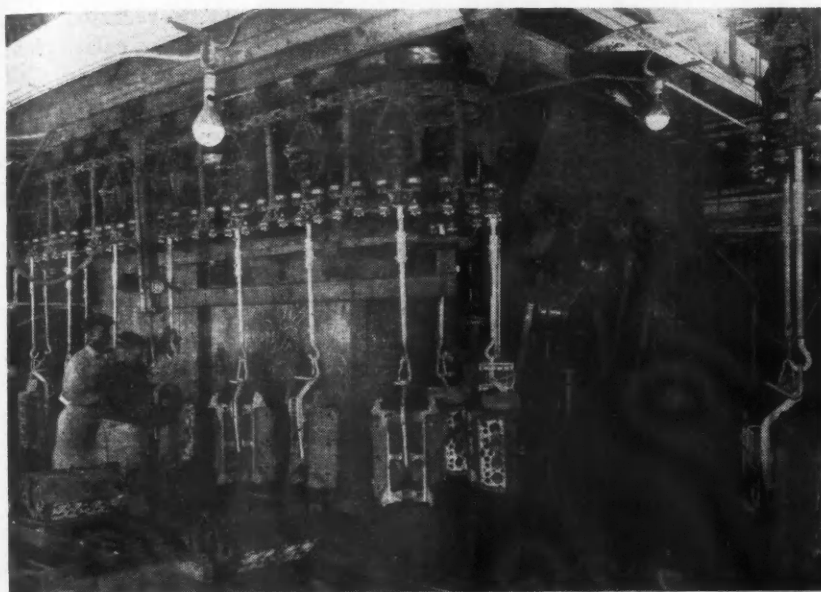
Cost and Responsibility

The integration of this equipment into the nation's airport system requires considerable time and money. For example, GCA equipment costs about \$150,000; ILS about \$35,000; high-intensity approach lighting \$70,000; h-i runway lighting \$45,000 and FIDO equipment about \$175,000 plus about \$30 a minute for its operation. Thus, complete all-weather equipment would cost about \$475,000 per airport or \$142,500,000 for the conversion of the nation's major airports to all-weather operation. This figure is to be compared with the CAA's 1948 budget request of \$102,462,000 of which only \$25,194,000 is earmarked for establishment of air navigation facilities of all types.

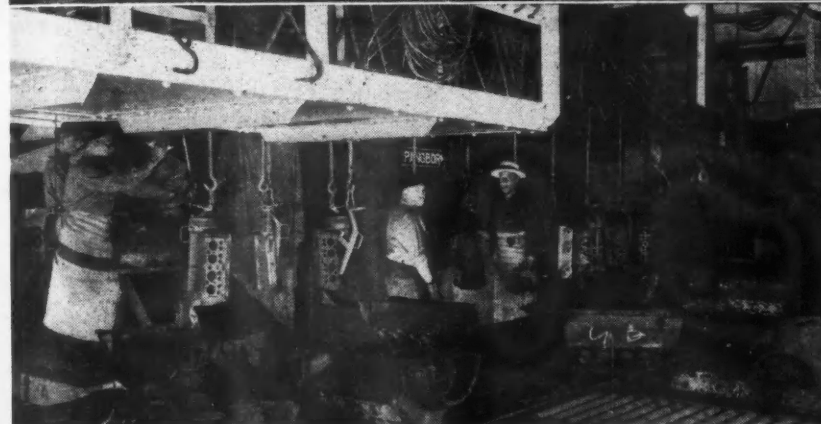
Present Plans

Work is progressing on the installation of 110 sets of ILS by the CAA at as many airports and GCA equipment on an experimental basis at New York, Washington, Chicago and Los Angeles. In CAA's view neither ILS nor GCA is the final solution to the problem and a number of systems are due for investigation at CAA's experimental landing aids station at Indianapolis
(Turn to page 68, please)

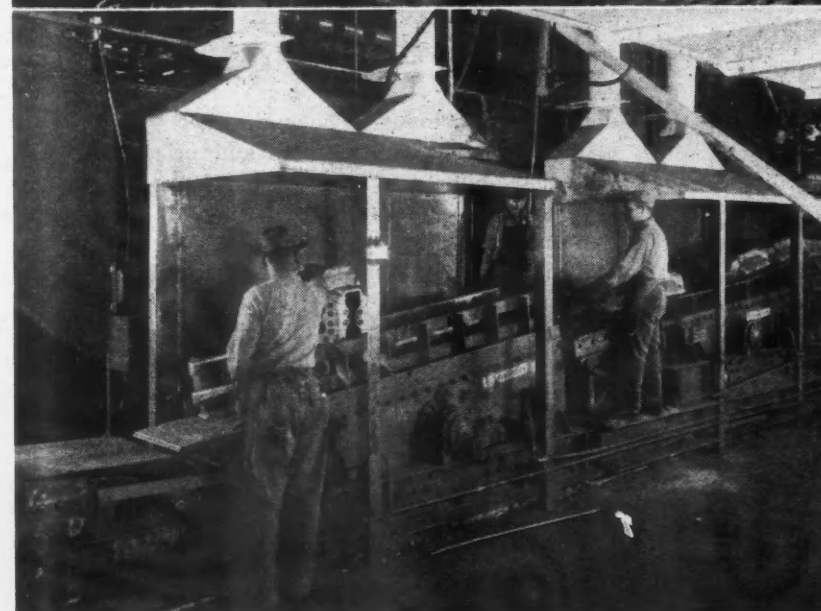
Specially Designed Machinery Cleans Newly Cast Cylinder Blocks



In operation at the Rouge foundry, Ford Motor Co., at Dearborn, Mich., are these specially designed shot-blast and centrifugal wheel shot-blast machines for cleaning newly cast Ford and Mercury cylinder blocks. Built by the Pangborn Corp. according to Ford specifications, the cabinets are 65 ft. high and have a capacity of 240 blocks per hour. In the above photo, Ford V-8 blocks are shown entering the cleaning cabinet through a rubber flapped aperture.



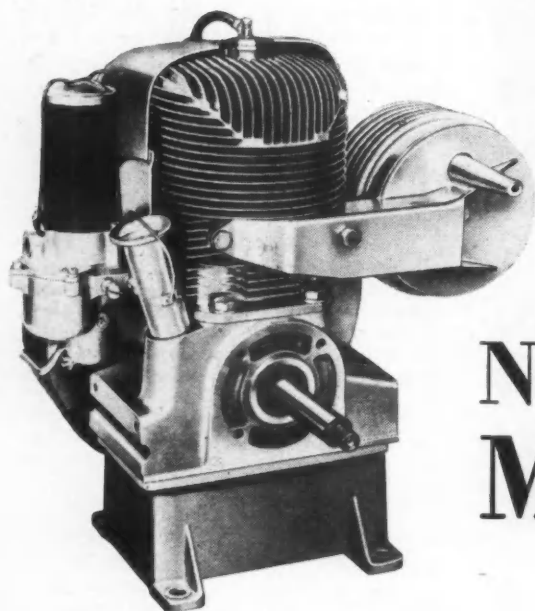
Blocks are in the cabinet for approximately five minutes, during which time special mechanical devices hold them in different positions for the cleaning operation. Shown here, the blocks are emerging from the cleaning cabinet.



In the final step of the shot-blast cleaning operation, the blocks are placed on a vibrating conveyor to remove remaining shot. This vibrating conveyor is divided into two sections to handle blocks in different positions.

THE new McCulloch Motors Corp. plant in Los Angeles, Calif. (see A & AI, Feb. 1, page 51), was designed and located to achieve a definite manufacturing aim—the economical mass production of lightweight gasoline engines. Before final plans were drawn, miniature replicas of the plant and every machine tool and other facility were laid out, and various locations of the buildings were studied to determine the effect upon production costs of such variable factors as transportation, availability of labor, and desirability of living conditions.

The completed plant consists of two buildings. The larger (400 ft by 160 ft) houses the general offices, shops, production testing facilities, and shipping department. The smaller building (50 ft by 150 ft) is devoted entirely to research facilities and offices for research personnel. Both buildings are entirely functional in every respect. Area now under roof is 75,000 sq ft. Expansion up to 200,000 sq ft.



Almost entirely built of high pressure aluminum die castings, this McCulloch 4-hp model 1200C is intended for use in various industries as a main or auxiliary power-plant. Automatic clutch and fuel injection are optional features.

Foundations of the buildings are solid concrete. Office floors are terrazzo. Walls are brick, with a center portion of glass brick into which are set modern stainless-steel sashes and windows. Structural members are steel, and interior walls are acoustical plaster on steel lath. Ceiling is the modern serrated type, with glass skylights facing the north. The entire plant is lighted throughout by white fluorescent lamps.

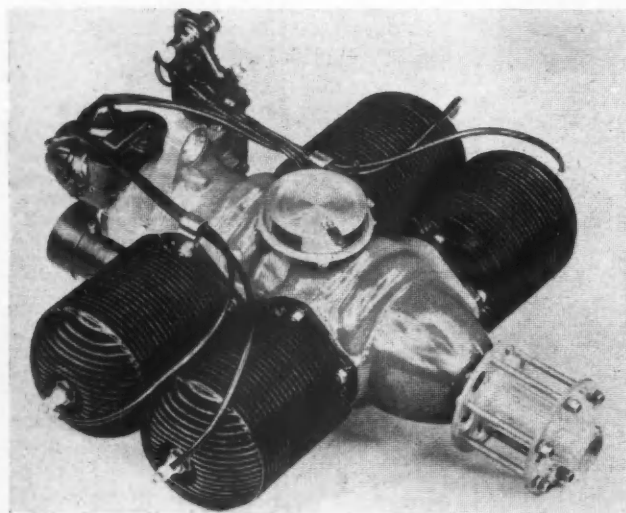
Facilities of the main shop are arranged to accommodate the flow of materials as follows:

Purchased products enter the plant through the receiving department at the west end of the building. An overhead conveyor line running the entire length of the building transports these supplies to the various stations in the plant where they are needed. Bearings, for example, travel to the final engine-assembly line. Connecting-rod forgings move directly to the connecting-rod machining line.

From the die-casting and other departments, the various parts converge by overhead and roller-type conveyors to the final assembly line which is immediately adjacent to the painting booth, the test and adjustment rooms, and the shipping department.

The production of McCulloch engines pivots around the

New Methods in Mass Producing

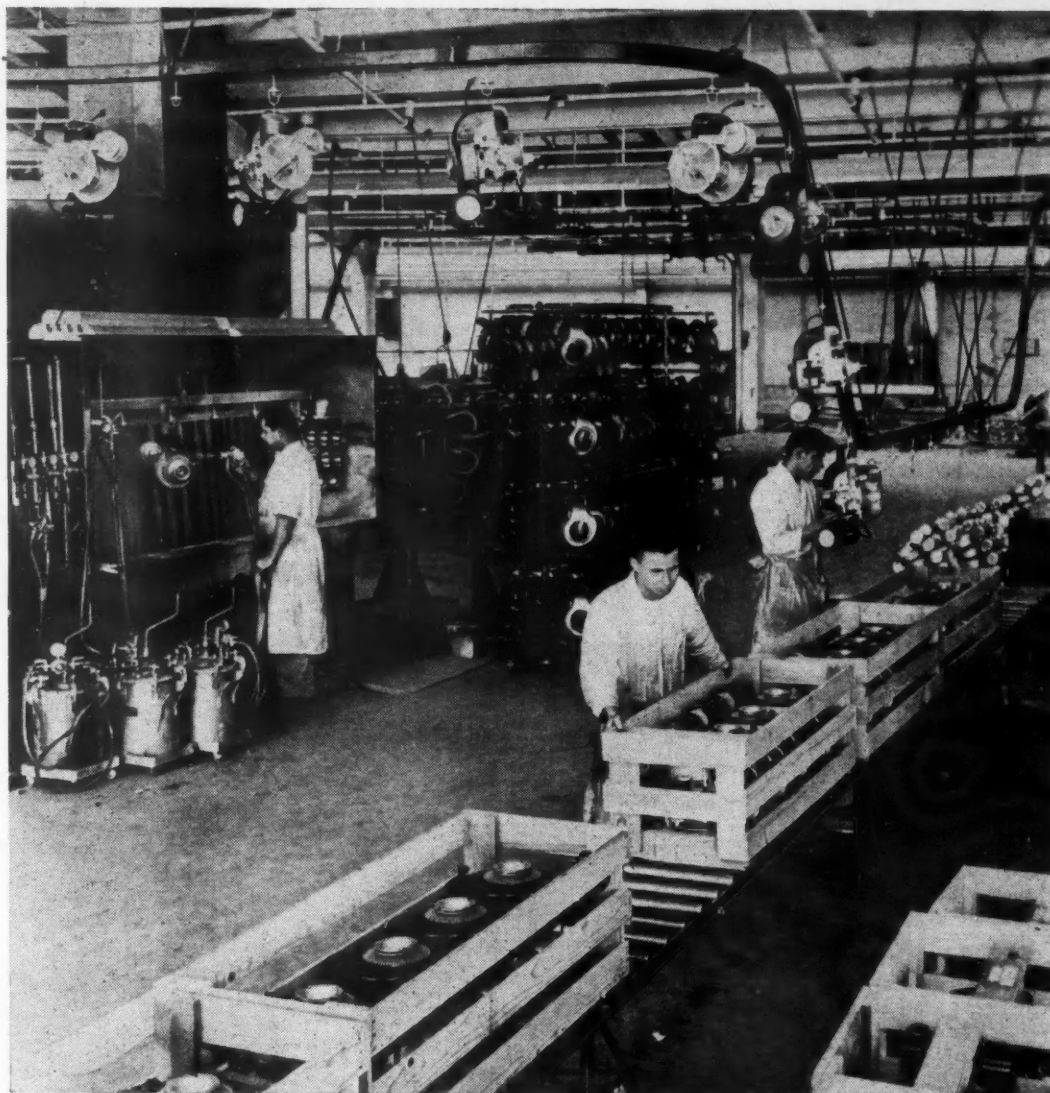


die-casting machines. The engines were designed for manufacture by this method, and prices and costs were determined upon the extensive use of company-produced, high-pressure, aluminum-alloy die-castings. Previous experience had conclusively shown that die-casting could be the key to the superiority in the efficient and economical production of engines.

Company facilities for die-casting will include: two Cleveland die-casting machines; six Reed-Prentice machines, one a 3G model with a 15-lb capacity, and six smaller 1½G models; four gas furnaces; four Ajax electric furnaces; and a complete die-sinking department with machine tools and machinists

Target aircraft are driven at over 200 mph by the McCulloch 60 hp two-stroke engine (model 4300)

Engines travel on overhead conveyor to the shipping department where they are packed in crates, moved on a roller-type conveyor to the shipping door, and loaded on trucks for shipping to final destination. In this view, a painting booth is also shown



Lightweight Engines

at McCulloch's New California Plant

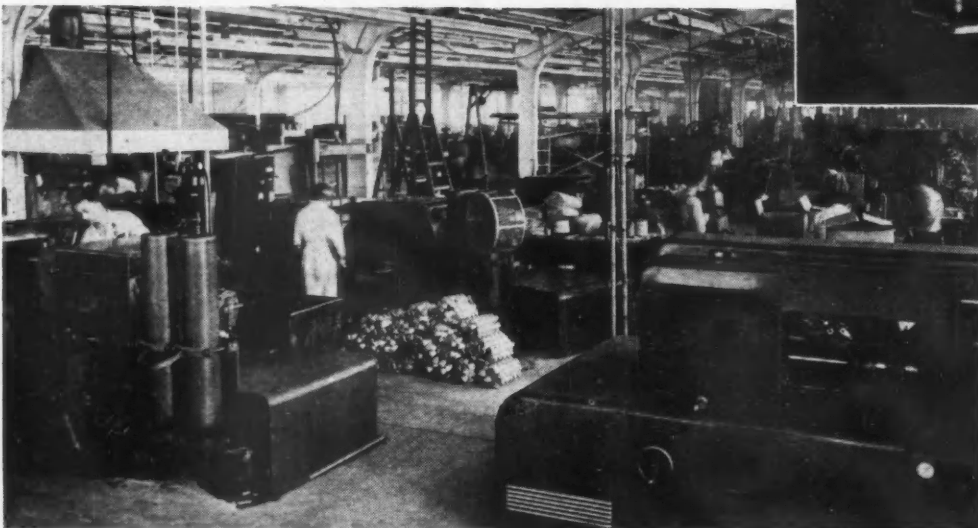
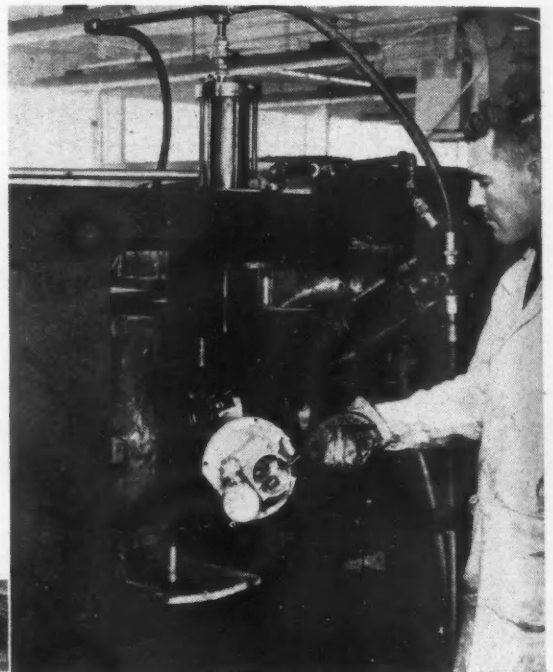
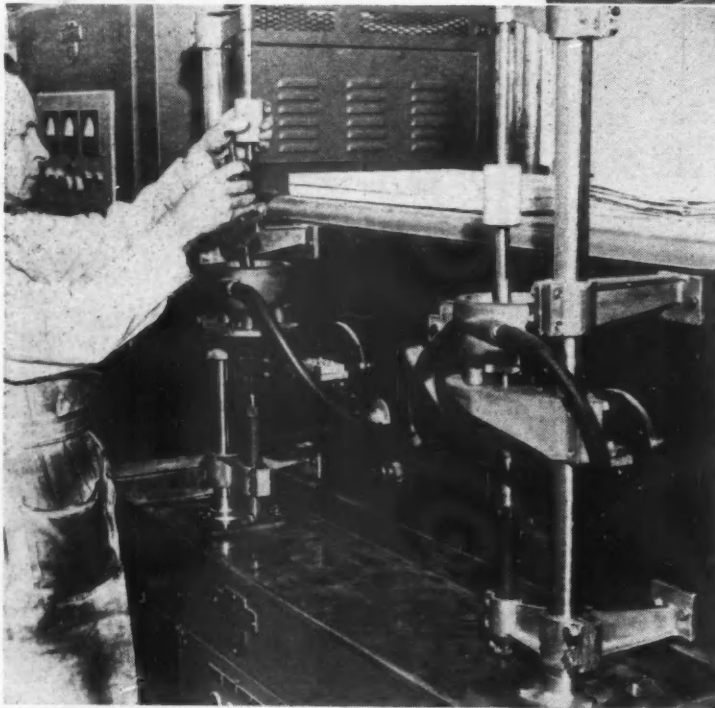
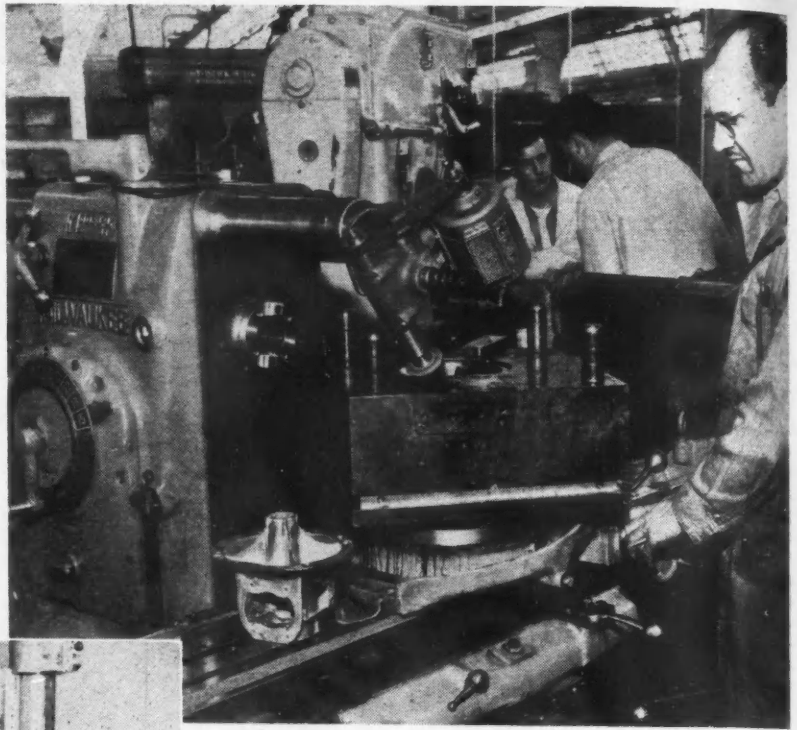
capable of producing the most complicated of dies. The installation of a 150 kva breakdown furnace is planned for the near future.

Another pivotal part of the mass-production plan is the crankshaft machining line. Crankshaft forgings, which are purchased from outside sources, are completely processed on a double line of eight Sundstrand and one Fay automatic lathes and ten Norton grinders. The crankshaft enters this line as a rough forging and emerges as a finished shaft, complete with induction hardening which is accomplished by three Thermonic induction machines

Manufacturing Operations and Costs Based on Extensive Use of Aluminum Die Castings. Five Models Now Being Built and 120 Hp. Opposed-Piston Engine Is Under Development.

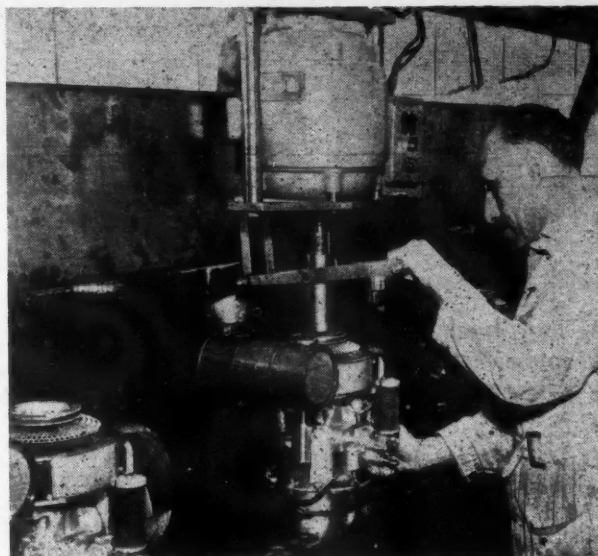
(Right) This Milwaukee milling machine in the tool and die department has been temporarily adapted with a grinder head for work on a crankcase die

(Below) A Thermonic induction heater, set up in the crankshaft production line, permits rapid and controlled case-hardening of the crankshafts. Oil for quenching is sprayed out of the head surrounding the shaft and is reclaimed in the tray underneath



A portion of the die casting department. Insert (above) shows Reed Prentice 15-lb 3C machine. The crankcase being die-cast for the 1200D engine requires a four-piece die, with three inserts, and four separate draws

Final tests and adjustments are being made at one of the McCulloch test benches. After a preliminary rpm check, engines are connected to a load and given correct governor and carburetor settings. Engines come to the test cell on a conveyor and leave by the same means



McCulloch Two-Stroke Engine Data

Model	1200C*	1200D	4300
No. Cylinders	1	1	4
Displacement	6.28 cu in.	6.28 cu in.	88.3 cu in.
Bore	2.0 in.	2.0 in.	3.0 in.
Stroke	2.0 in.	2.0 in.	3.125 in.
Output	4 hp at 4000 rpm	2.5 hp at 2500 rpm	53 bhp at 3000 rpm
Compression Ratio	.....	.....	8 to 1
Weight	24 lb	23 lb	74 lb

* 1200B is a specific purpose engine of 3.7 hp similar to 1200C. 1200E is an adaptation of 1200C.

installed in the grinder line for crankshaft production.

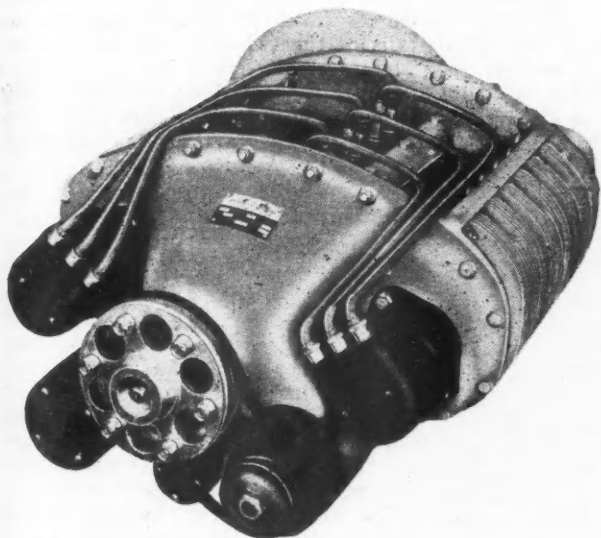
Because of the extensive use of die-casting, the miscellaneous machining operations that might be expected in an engine plant are little in evidence. Most of the machining operations that are required are set

up on special-purpose production tools. Smaller jobs, such as the drilling and reaming of carburetors, connecting rods, and magneto housings are done on series of drill presses equipped with fixtures for single-purpose operations. Boring of cylinders is done by a six-spindle Barnes machine, which performs six operations simultaneously. Honing is then completed on a single-spindle Barnes.

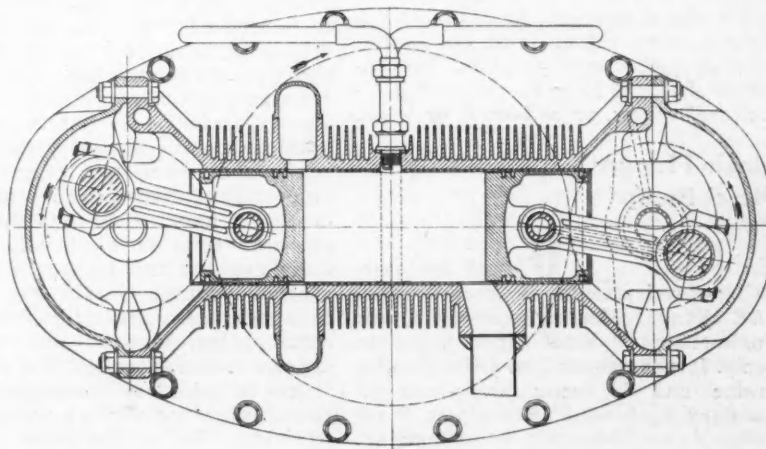
At present, parts and sub-assemblies are delivered to the final line from sub-assembly tables. Assembly operations are timed so that an approximately equal amount of time is required at each station. This permits the smooth movement of the engine, as it is being assembled, from the first station to the last, at which point it is fully assembled and needs no further additions.

The painting of engines is rather novel, in that engines are preheated. They move from the assembly line on an overhead conveyor through an enclosure lined with infra-red lamps. Still on the conveyor, they then travel across the paint spray booth, the back of which has a curtain of falling water to prevent the

(Turn to page 92, please)



McCulloch has had prototype models of this 120-hp three-cylinder, two-stroke engine under study and test for several years and it is to be placed in production in another year. A transverse sectional drawing of the engine also is shown here



Observations

by Joseph Geschelin

A New Shock Absorber Coming

ONE of the parts makers not identified with motor car suspension products reportedly has developed a unique type of direct acting shock absorber for motor cars. It is said to possess inherent variable rate characteristics and capable of absorbing shocks ranging from violent bumps to slight disturbances in boulevard ride. This equipment is under test to determine its superiority over other types of shock absorbers.

Aircooled Engine For Buses

AN AIRCOOLED flat engine of about 150 hp output has been developed for large bus installation, two engines being used in one vehicle. Major feature of the engine is specialized design which is said to impart a life of at least one million miles, the objective of coach operations.

What's Needed In Turn Signal Field

FROM one of the oldest of the lamp makers in the trade comes word of the development of a line of turn signals suitable for motor cars, trucks, and buses. In fact their representative made the statement that before long they would have a package that could be sold for ready installation on almost any make and model motor car now on the road. What is badly needed in this field is standardization, under official auspices, to define an acceptable turn signal from the standpoint of operational qualities. For instance should it be in the form of a directional arrow, or a flasher, or what.

Single Plunger Diesel Pump

ONE of the interesting developments disclosed at the SAE Annual Meeting was the Bosch single-plunger diesel fuel injection pump. It was mounted on a Continental engine and is being announced as standard equipment on the new Waukesha line. This unit is so compact

that within a relatively small space it incorporates the fuel injection system, the primary fuel feed pump, and built-in governor. There is some conjecture, too, that this type of unit can be modified to handle solid injection of gasoline.

What Are The Facts

INDUSTRIAL dermatitis is one of the controversial problems in shop operation. Skin boils, eruptions, rashes, etc., have been blamed on many things and frequently blamed on the cutting fluid. Some time ago the Independent Research Committee for Cutting Fluids investigated the literature on the subject and found confusion and misunderstanding. More recently the problem has been referred to a medical advisory group for further investigation. Instead of theory and conjecture the new project will aim at analysis of case studies to determine once and for all whether medical reports prove that incidence of skin trouble can be attributed to cutting fluids. There is reason to believe that infections traceable to cutting fluids alone will be found quite negligible and unimportant. Maybe not. At least, for once, we shall have a study based upon case history rather than laboratory experiment.

Synthetics and National Security

SOME of the people in the tire business are quite concerned about the future course of synthetic rubber plants. They are not too enthused about the possibility of mixing more natural rubber with synthetic except for the time being. From the standpoint of national security they would prefer to operate synthetic plants at some normal peacetime capacity and depend upon research to uncover formulations which would make synthetic tires equal or superior to post-war tires in most respects. In their opinion, the danger in reducing synthetic output lies in our reliance once more upon natural rubber and its cartel-ridden, tenuous and uncertain supply. International control of rubber makes its price level too speculative for the maintenance of the price of rubber products. By contrast our own syn-

thetic plants when operated to capacity will provide an unfailing supply at economic cost levels.

Intake Valve and Manifold Gumming

ABOUT this time last year there was considerable excitement among truck operators because of an epidemic of intake valve and intake manifold gumming. By now the hue and cry has subsided but no one has yet given an official and conclusive explanation for the phenomenon. Some have associated the problem with fuel quality and assume that lacquer was deposited at intake system temperatures. Whatever the real cause, we understand that upper cylinder lubes of various proprietary makes have been effective in clearing the atmosphere. It was and possibly still is being added to the fuel tank by the operator and perhaps to the fuel before it is delivered to the large fleet user.

Small Engines

JUDGING by our own pipe line the war use of small engines has stimulated interest in the development of small single-cylinder engines for utility uses. Some time ago we described in this publication the details of the two-cycle engine made by Bell Aircraft for the Rototiller. More recently we have been told about work in progress by others—two- and four-stroke designs for gasoline and diesel fuel.

Cooling of Cutting Fluids

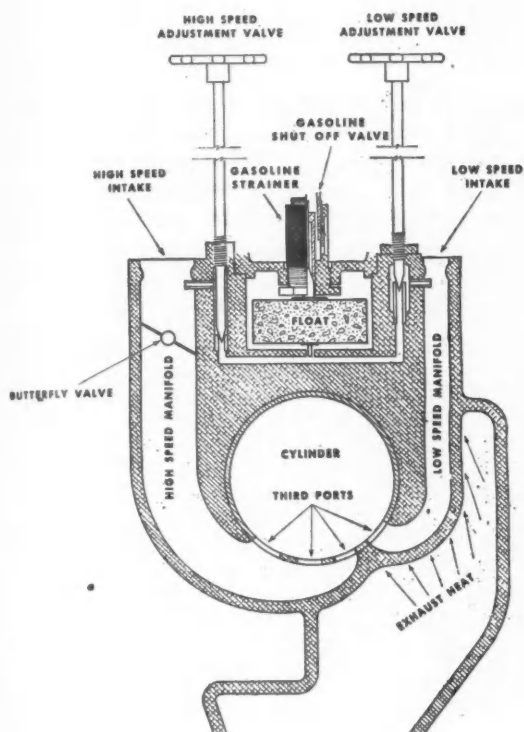
REFRIGERATION of cutting fluids was stimulated during the war what with the drive for extremely fine tolerances. Expediency and lack of time for research doubtless contributed to the trend. We learn now that this interest has waned with the return to peacetime operations. While the need for holding cutting fluid at reasonable temperature levels consistent with operating conditions still exists we are told it will be accomplished by simpler means. Evidently development along this line is in the works but confidential at the moment.

Suspension Systems

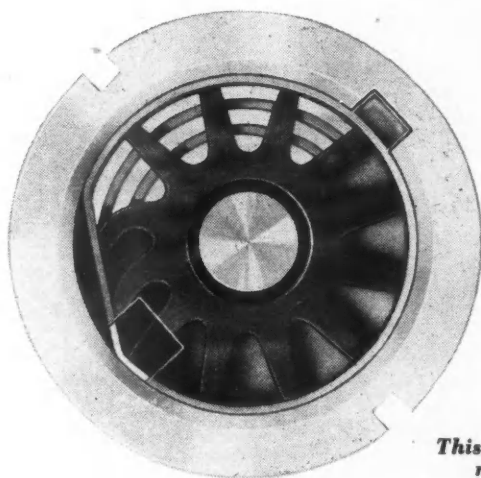
SPECULATION is rife concerning spring suspensions for motor cars. One of our friends tells us of a unique system said to be independent of spring rate and seemingly unaffected by bad terrain. We expect more on this later.

Novel Outboard Engine Design—

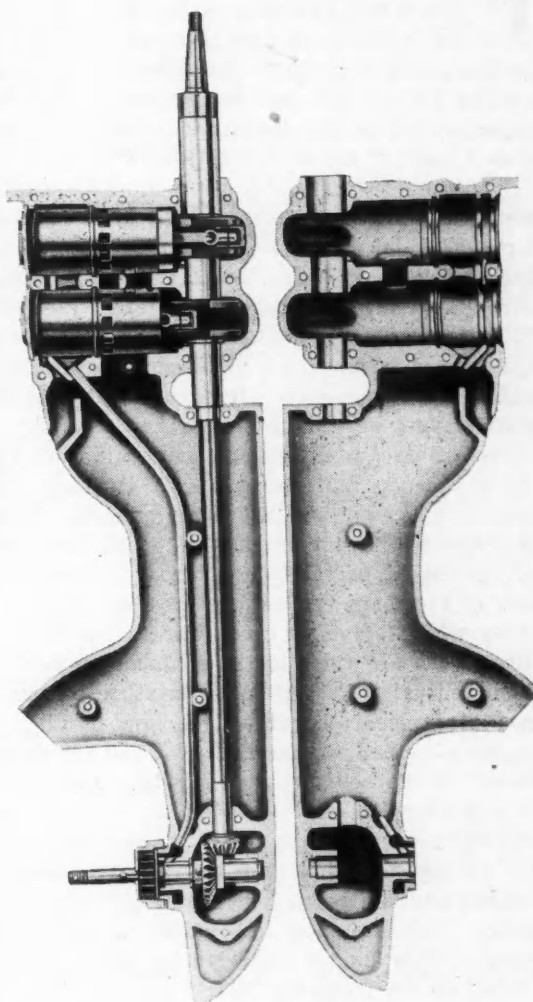
Two-Piece Housing and Dual Carburetion



Here is a schematic drawing of the carburetion system showing the separate high and low speed systems



This rotary water pump, used in the Flambeau motor, has a Neoprene elastic impeller



Unusual feature in small engine design is this two-piece, die-cast aluminum alloy housing of the Flambeau outboard two-stroke engine, manufactured by the Metal Products Corp. Two-piece construction is said to facilitate repairs on the engine, making possible removable bearings and cylinder sleeves. This model has a piston displacement of 9.24 cu in. with a bore of 1 15/16 in. and stroke of 1 9/16 in.

Air at —70F for Engines On Test at P&W Aircraft

To test experimental aircraft engines at the —70F temperatures which they will encounter in flight at altitudes up to 40,000 ft, Pratt & Whitney Aircraft Division of United Aircraft Corp. has started construction of a dynamometer and refrigeration building.

Equipment to be installed in the new structure will enable the firm's engineering department to carry on extensive development work on more power-

ful highly supercharged engines designed for high altitude flying. These power plants cannot be tested for altitude performance under sea level temperature conditions.

Equipped with two 5000-hp electrical dynamometers, the reinforced concrete and steel building will have a length of 95 ft and a width of 84 ft. It will be about three stories high. Refrigeration compressors will be driven by elec-

tric motors delivering a total of 1500 hp, sufficient to supply cold air also to test stands.

A liquid, cooled to —80F, will be piped from the refrigerating units to air cooling coils located on the roof of the new building and to similar coils situated on the roofs of a number of existing test houses. Air from these cooling coils will be fed to the engines on test at temperatures as low as —70F.

Automatic Control

PRESENTED here a schematic diagram of the Bendix direct fuel injection system and a description of its fuel control unit that meters fuel to the injection pump in amounts determined by automatic correction for altitude and temperature. Details of the injection pump and discharge nozzle appeared in the Feb. 1 issue of *AUTOMOTIVE AND AVIATION INDUSTRIES*.

The fuel-control unit consists of three principal elements: an automatic-mixture control; a regulator; and a metering-jet element. The general operation of this fuel-control unit is similar to the control unit of the Stromberg injection-type carburetor (see June 15, 1941 issue of *AUTOMOTIVE INDUSTRIES*). However, the system has undergone considerable design refinement, and is described with reference to the new diagrammatic layout reproduced here.

The airstream enters the fuel-control unit through the air scoop and passes down through two main venturi and four smaller boost venturi. This action produces a vacuum or suction which is a maximum at the throat of the boost venturi. Inserted in the wall of the main venturi are a series of small impact tubes which serve to communicate the impact pressure in the air scoop to the chamber surrounding the main venturi. The automatic mixture control, located in the air scoop, regulates the flow of air from the impact chamber to chamber A of the regulator. The throat of the boost venturi, on the other hand, communicates with air chamber B. Hence, the diaphragm separating chambers A and B is subject to the difference of pressure between the boost venturi suction and the regulated impact pressure of the air scoop. This pressure differential varies with rate of mass air-flow, and is employed for controlling the flow of fuel to the metering jets.

Automatic Mixture Control

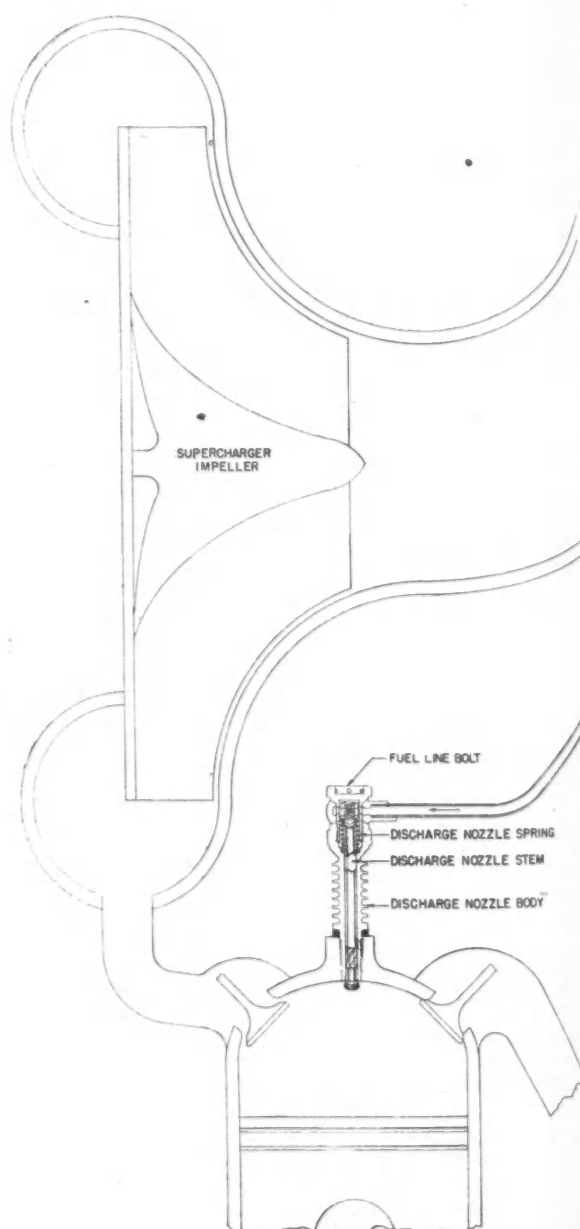
Operation of the automatic-mixture control remains the same as that on the Stromberg injection-type carburetor, being sensitive to changes in atmospheric pressure as well as temperature. It contains a bellows or syphon element filled with inert oil and nitrogen, the upper end of the syphon being fixed while the lower end is secured to a valve controlling the passage between the impact pressure chamber and chamber A. As atmospheric pressure drops, the bellows expands and partially closes the passage, thus regulating the flow of air from the air scoop to chamber A.

Regulator

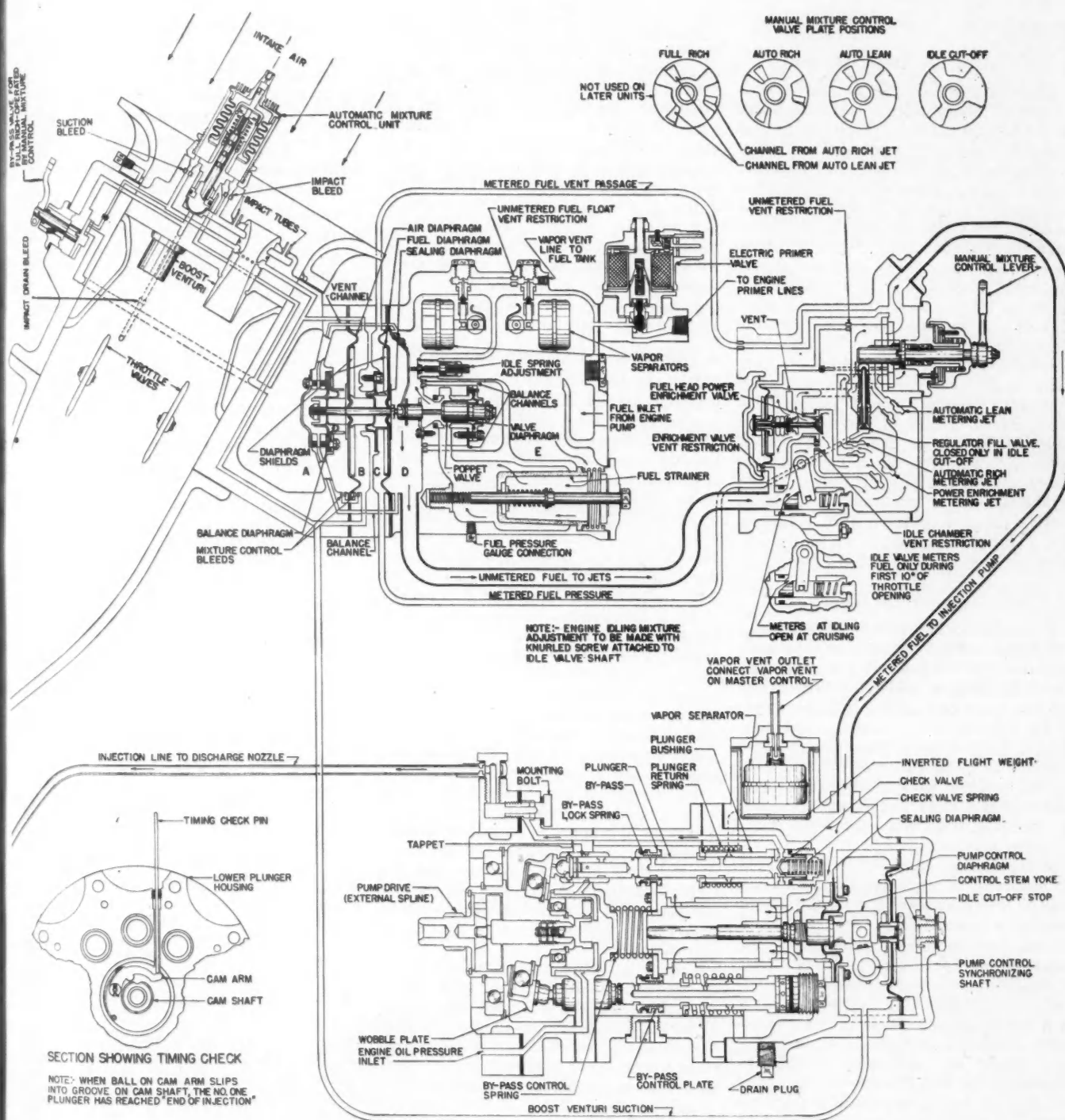
Fuel from the engine pump enters the regulator into chamber E, flows through the filter at the lower end,

and passes to the fuel poppet valve. Action of this valve is differentially controlled by the diaphragms between the air chambers C and D. Pressure in chamber C comes from the flow of metered fuel from the metering-jet unit at the right of the diagram, while the pressure in chamber D is from the unmetered fuel-flow. Under conditions of steady flow, the pressures

(Turn to page 94, please)



Meters Fuel in Bendix Direct Injection



Schematic diagram of Bendix direct fuel-injection system

What's Most Needed Now To Solve Our Labor Problems

Ten Vital Points, presented by General Motors President C. E. Wilson on Feb. 5 to the United States Senate Committee on Labor and Public Welfare, are given in the following paragraphs:

1. Set up Equality Under the Law

There must be equality and justice for all in labor matters. Unions must be subject to the same laws regulating group and personal conduct that apply to all other groups and all other citizens. Unions should not expect or be given any special privileges to resort to violence or intimidation. Employers must have the unquestioned right of free speech regarding labor matters affecting their employees on the same basis as union leaders and all other citizens. Unions and strikers must be responsible for their acts and not have special immunities under law which protect them from the just consequences of their acts. If the National Labor Relations Board is left in the picture, its functions should be changed so that it does not attempt to be prosecutor, judge and jury. The courts must be re-established in a position to dispense justice under impartial labor relations law. This will require review and necessary revision of all pertinent laws.

2. Define Collective Bargaining

To promote industrial peace and to avoid the misunderstandings that have arisen under the present law regarding the obligations of collective bargaining, the law must be clarified in three ways: 1. By defining what collective bargaining is; 2. By establishing the minimum procedures to be followed by both parties in order to fulfill their legal obligations under collective bargaining; 3. By defining accurately the legal scope of collective bargaining.

Many strikes have occurred because of different interpretations of existing law by the parties, the National Labor Relations Board and the Courts. Both unions and employers must have the same legal responsibility in bargaining. A minimum procedure should be specified which fulfills this requirement and is a practical way of resolving the issues. Furthermore, collective bargaining should be reasonably limited to wages, hours and the conditions under which the employees actually perform work. It should not be extended into other areas, such as pensions and welfare funds, managerial functions or competitive business relations. To permit such extension would only broaden the areas of dispute and create new issues over which more strikes and stoppages are bound to occur.

3. Prevent Unionization of Management

After much controversy and litigation the National Labor Relations Board and the courts have placed certain management employees in a dual capacity, expecting them to function both as agents of management and as unionized employees. The National Labor Relations Act under this technical interpretation is contradictory and self-defeating and must be changed by Congress. Management can function only through individuals, and individuals who have collective bargaining responsibilities or positions of management trust cannot properly fulfill their duties if at the same time they are subject to union control. As a practical matter, to make collective bargaining work, the status of such management employees must be clearly defined by placing them on the management side of the bargaining table.

4. Compulsory Unionism Un-American

Did our laws intend to give employers and unions the right enforced by law to execute contracts which require discrimination in employment for membership or non-membership in any labor organizations? If so, or if they can be so interpreted, do we want to continue such un-American and undemocratic laws? Such a principle is inconsistent with our liberal philosophy and deprives individuals of basic rights which all citizens have. A contract requiring compulsory membership in a union is as bad on one side as the outlawed "Yellow Dog" contract would be on the other. They both violate basic rights of individuals. The most basic democratic freedom is the right to dissent even from the opinion of the majority without being subject to coercion and the loss of individual liberty.

Furthermore, closed shop or union shop contracts are clearly monopolistic. Much of our current difficulty springs from such contracts and the effort to impose them on both the men and the employers. Our labor laws should not sanction such contracts. The abuses of compulsory unionism can no longer be tolerated.

I have no objection in principle to the voluntary check-off of union dues provided that the employee can withdraw his authorization at any time on a reasonable notice. Such an arrangement for the convenience of union members does not violate any fundamental principle.

5. Curb Union Monopolies

The monopoly power of national and international unions must be curbed by law. Industry-wide bargaining should be prohibited as it is the essence of monopoly in labor relations and if carried to its logical conclusion through-

out all American industry will destroy our free competitive system. This monopoly power exercised through industry-wide bargaining has already challenged the supreme power of Government and, if sound corrective measures are not taken now, the power may develop to a point where some day such minority pressure group action will destroy our free society. Therefore, in principle I am in favor of any legislation which would effectively prohibit industry-wide bargaining. There are various possible ways of accomplishing the same purpose, other than those in the proposed legislation, which should be explored. One possible way would be to withdraw the sanction of law for collective bargaining by unions having or exercising monopoly power.

6. Eliminate Secondary Boycotts and Sympathy Strikes

Secondary boycotts are the clearest example of the type of obstruction to interstate commerce arising from labor disputes that in theory the National Labor Relations Act was intended to eliminate. If the use of secondary boycotts is not stopped, the freedom of an American citizen to enter any legitimate business he chooses or even to remain in business will be subject to the whim of union leaders. Small businesses and even larger ones will be destroyed. Even farmers will be harassed. Competition will shrivel, but rackets will thrive.

Sympathy strikes are also flagrant abuses of power and usually are acts of complete irresponsibility. Carried to their conclusion, sympathy strikes become general strikes and thus amount to civil mutiny. Many of these practices cannot now be enjoined in the courts, and are not subject to the anti-trust laws. Without legislation covering such activities government itself is impotent. Boycotts and sympathy strikes are clearly conspiracies in restraint of trade and should be defined as illegal.

7. Outlaw Jurisdictional Disputes

Jurisdictional strikes are of two types:

1. A conflict between two unions over which should have representation rights for employees.

This type of jurisdictional dispute can and should be resolved by legal procedures to determine bargaining units and representation and should be resolved without strikes. When employees strike over such an issue, either before or after a legal determination of the proper representation has been made, the union should be subject to injunction, and the employees involved should be subject to the loss of their legal status as employees.

2. Those disputes in which unions strike over the question of which union's members should perform certain work.

If either or both unions strike after
(Turn to page 62, please)

NEW Production and Plant EQUIPMENT

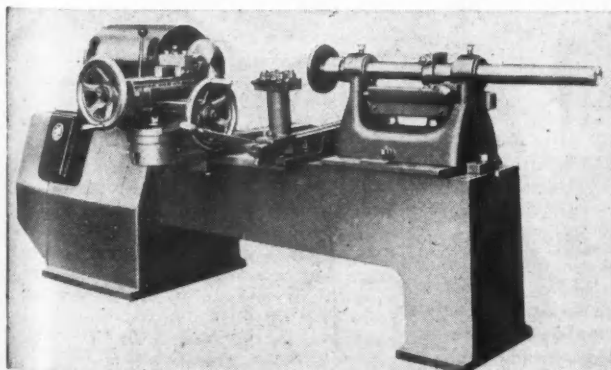
NEWLY-DESIGNED second operation spinning lathes in two sizes are now in production at the E. W. Bliss Co., 440 Amsterdam St., Detroit 2, Mich. Not recommended as an alternative to the toggle press for producing shells from flat discs, these lathes are primarily intended to supplement the latter machines by accomplishing secondary spinning operations on products previously drawn in presses, and at a rate commensurate with the primary operation.

By using welded steel construction for the frame it is possible for the company to install a fully enclosed, V-belted motor drive and gear box, without any increase in weight above that of the bare machine as furnished in the old design.

A combination multiple-disc friction clutch and brake provides instant stopping and starting, which, together with the fast acting tail-stock toggle clamp, permits rapid loading and unloading of the machine. The tail-stock's offset adjustment allows use of inside form rolls to replace sectional chucks that are used for many necking operations.

The new lathes are offered in two sizes, with up to 30 in. swing and 92 in. bed-length. Headstock spindles run on Timken bearings at the following instantly variable speeds: Model No. 15 at 275,365,615, and 1140 rpm; Model No. 16 at 180,370,675, and 1140 rpm. The lathes weigh 1500 and 3000 lb respectively.

Lateral and longitudinal handwheel control of the compound rest provides maximum rigidity for the spinning and burnishing tools. Other attachments include a wiring rest, operated by a tilting lever, that can be pivoted to approach the work from any desired angle.

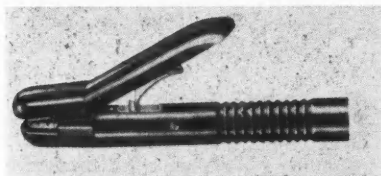


Bliss second operation spinning lathe

Also available are a standard tilting rest for combination trimming and wiring, and a special trimming attachment for straight shells without flames.

THE LITTLE DAVID electrode holder, made by the Lacey-Webber Co., Kalamazoo, Mich., is said to operate with a temperature rise of only 50 deg. It is rated at 350 amp for rods up to and including 1/4 in. in diam.

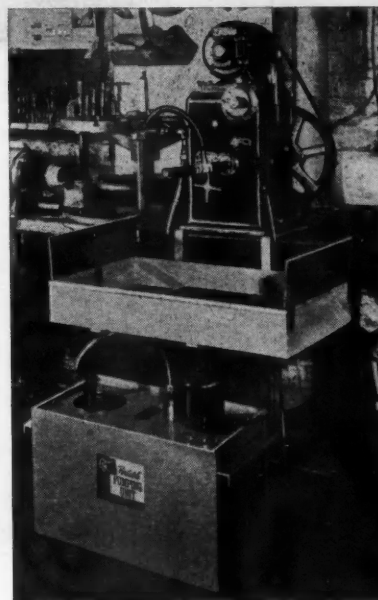
A combination of design and material is said to be responsible for lower temperature operation. The Little David is made of copper bearing aluminum alloy, combining lightness with



Little David electrode holder

strength. A key-hinged fulcrum makes possible maximum conductivity.

Additional advantages of the new holder, manufacturers pointed out, are its slip-on insulating covers, overall insulation protecting both operator and equipment, and on-the-job maintenance because of Allen head screws. The same slip-on insulating cover is used on either the top jaw or bottom jaw. Both tong and reversible slip-on jaw covers are of the domed, ventilated type. Contact points on the jaws are extruded from 99.9 per cent pure hard copper.

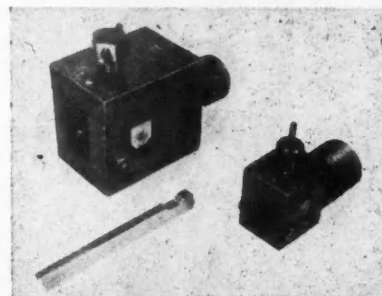


Wet-cutting conversion unit for Sunnen hones

A WET-CUTTING conversion unit for use on Sunnen bushing grinders has recently been announced by the Gray-Mills Corp., Evanston, Ill. The wet-cutting system can be attached to the grinder without cutting or drilling.

A quiet-operating, fractional-hp centrifugal pump is mounted in a 12-gal baffle-equipped coolant tank, and pumps cutting oil to the work through oil-resisting neoprene lines. A flexible metal nozzle directs flow onto the work. From the work the oil flows to a return pan which slides in place beneath the mandrel. The pan has removable splash shields. Here the bulk of the abrasives is separated from the fluid by a baffle plate before flowing back to the pumping unit for re-circulation.

ACME BROACH CORP., E. Third St. at Delaware, Lexington, Ky., offers a positive lock broach puller for use with keyway broaches having notched shank



Acme broach puller

ends. These pullers are made in two sizes to suit all keyway broach requirements. The small size, No. 0 puller, is suitable for use with shanks up to 3/4 in. wide by 1 in. high. The larger, No. 1 puller, is suitable for any notched

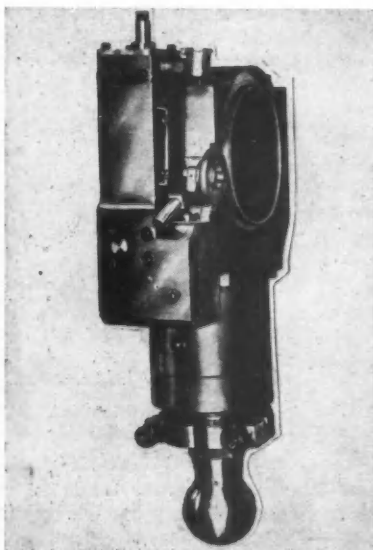


"Pul-Pac" attachment

type shank up to and including 1½ in. by 1½ in. size.

The pullers are equipped with means for centralizing the broach shank, so that shanks of varying widths can be used. Both sizes of pullers have 2 in. 8 P thread, which is standard for connection to broaching machines.

DAYTON ROGERS MANUFACTURING CO., 2830 13th Ave., Minneapolis 7, Minn., has placed on the market a new Model HP safety overload connecting link, which may be applied to punch presses by replacing the present conventional pitman, or connecting rod, and ram adjusting screw. This hydraulic safety overload connecting strap is arranged to give the necessary tonnage protection within the maximum tonnage capacity of the punch press. It not only protects the crank and press frame, but can be so arranged to protect any of the tools used



Hydraulic overload punch press pitman

in the press. It will also compensate for stock thickness variation, or the inserting of two blanks on a forming die on all operations, such as forming, pressing, riveting, briquetting, assembling, etc., because a constant ram pressure is assured at the point of operation at all times. It is now being built in various sizes for press capacities from 37 to 250 tons.

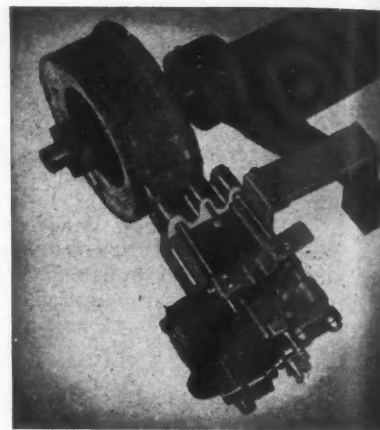
A SIMPLIFIED method of material handling, with unit loads mounted on disposable carrier sheets of corrugated paper board, fibre board or other material instead of conventional wood or metal pallets, is revealed by Clark Trutractor, Battle Creek, Mich., in introducing its newly-developed "Pul-Pac."

"Pul-Pac" is a combination of a push-pull attachment for Clark forklift trucks, with a flat steel plate serving in place of conventional forks, combined with an inexpensive load base of paper or other material, to receive, lift and carry unit loads. A hydraulically-actuated gripper device moves forward, clamps an extending margin of the carrier sheet and pulls sheet and load onto the plate. At destination the load is lifted and registered directly over the area onto which it is to be deposited, and the pusher device, working against the load, deposits the carrier sheet and its cargo in the exact desired position as the backing truck withdraws the carrier plate.

A BUFFING compound applicator that has an intermittent feed control operating at the rate of 14 strokes per minute, affording a feed ranging from .0015 in. to .015 in. per stroke is announced by the George L. Nankervis Company, 5442 Second Blvd., Detroit 2, Mich. The Nankervis applicator can be mounted on any automatic machine (either right or left-hand) and

can be adapted to everything from the simple to complex multiple-stage buffing operations. It is driven by a totally-enclosed, 110, 220 or 440-volt, geared head motor.

The quick action compound applicator clamp, with adjustable features to compensate for variable thicknesses and standard carrier, will accommodate any length stick of compound up to four



Nankervis applicator

in. Special carriers for wider cakes are available.

Total weight is only 20 lb. Light weight permits adaptation to floating heads without disturbing balance.

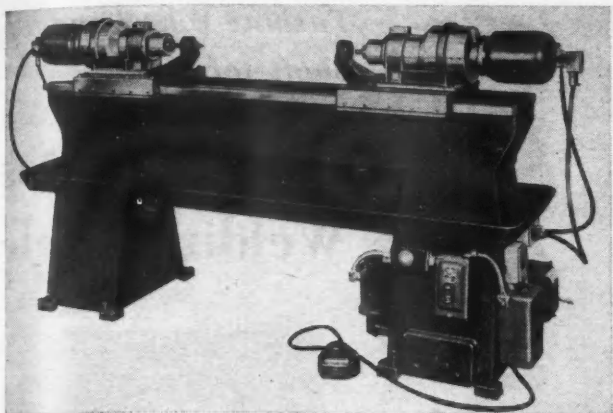
PHOTOSWITCH, INC., 77 Broadway, Cambridge 42, Mass., has brought out an electronic welding timer, Type

Variable-Speed Buffing and Polishing Lathe



Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich., has added this machine to their line of polishing and buffing lathes. It is known as the Model VROL—a 3-hp variable-speed polishing and buffing lathe with a speed range of 1500 to 3000 rpm. This is accomplished by turning the hand-operated dial. The spindle overhangs 8 in. to permit handling of bulky parts. Motor is mounted in the base with "V" belt drive.

AUTOMOTIVE and AVIATION INDUSTRIES



Robotrill centering and drilling machine

30CR3, for interval timing of welding operations over a range of three to 120 cycles. It may be used with all general-purpose spot welders, and fulfills the specifications of NEMA Class 1A timers. It is applicable to manual, air or motor operated welding equipment requiring either beat or non-beat operation.

The timing adjustment can be set for any interval from three to 120 cycles. It is calibrated at these two settings,



Photoswitch electronic welding timer

and its accuracy throughout the range is within two per cent. The timing adjustment is located on the panel inside the housing. The timer may be used with either a 115 or 230 volt a-c supply. By selection of terminals on the terminal panel, the timer will provide beat or non-beat timing.

THE ROBOTRILL automatic cycle centering machine and Robotrill drilling heads, distributed by Klatt & Wood Co., 329 20th St., Toledo, Ohio, are claimed to reduce the margin of human error by robot-like control of centering and drilling.

The centering machine can be provided with either general or special work fixtures, and will center pieces up to 36 in. or longer. This machine can also be adapted for two-way drilling when not in use on centering operations.

The drilling heads embody robot-like

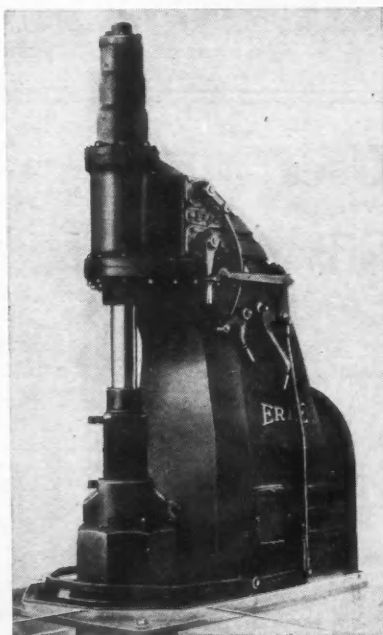
control of the drilling operations to produce precise, clean-bottom drill holes.

This is made possible in several ways—micrometer adjustment of the spindle, depth control to within .002 in., even pressure on the spindle during the work stroke by centrifugal force of positive driven balls and release of the drill spindle without shock.

Robotrill heads will operate in any position or angle, and may be installed in any special machine where standard mounting brackets cannot be used by boring a hole to fit the body of the head. They may be installed on automatic screw machines for drilling cross holes in parts being machined.

In construction, Robotrill heads are self-contained units, using standard

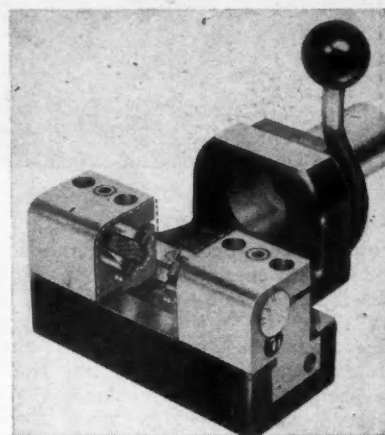
Pneumatic Forging Hammer



The Erie Foundry Co., Erie, Pa., is now offering for sale a line of self-contained pneumatic forging hammers, of the type illustrated above. These hammers are built in sizes ranging from 200-lbs to 3000-lbs falling weight, and allow manufacturers to do flat-die-forging work in their own plants without need for separate steam or air supply.

motors and precision ball bearings. As all parts of the head are keyed together, only the rear thrust bearing and the front spindle bearing are subject to wear.

THE NEW "Universal" cam-action retractable knurling tool made by Universal Vise and Tool Co., Parma, Mich., is adaptable to any engine lathe or turret lathe. Advantages claimed include its ability to rapidly knurl long, thin work, and to clear threads, pilots, and other sections of the same diameter as the portion to be knurled. Cam-action retracting mechanism is self-



Universal retractable knurling tool

locking to free operator's hands while the tool is feeding.

Other features are instant adjustability to any diameter up to 2 in., and the formation of different knurl patterns without changing knurls.

North American Aviation Acquires Additional Space

North American Aviation, Inc., has received approval for immediate occupancy of a portion of the government owned Douglas Aircraft plant at Long Beach, Calif. The additional space will be allocated to enable North American to complete a new contract for construction of military aircraft. Approximately 500,000 sq ft of manufacturing and warehouse space will go to the company immediately on an interim lease basis for an indefinite period.

Estimated employment of 2000 to 2500 persons at Long Beach is expected to result from acquisition of the added space. Hiring will commence as soon as all operational arrangements are completed. The resulting approximate payroll will be \$6 million annually, according to J. H. Kindelberger, president, North American Aviation, Inc.

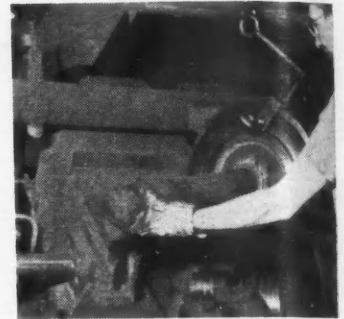
Advertising Note

Behel and Waldie and Briggs, Inc., Chicago advertising agency, has opened a Western Michigan office, effective Jan. 2, at 10 E. Broadway in Muskegon Heights.



Turbine Wheel and Shaft Joined in

Three Minutes Welding Cycle

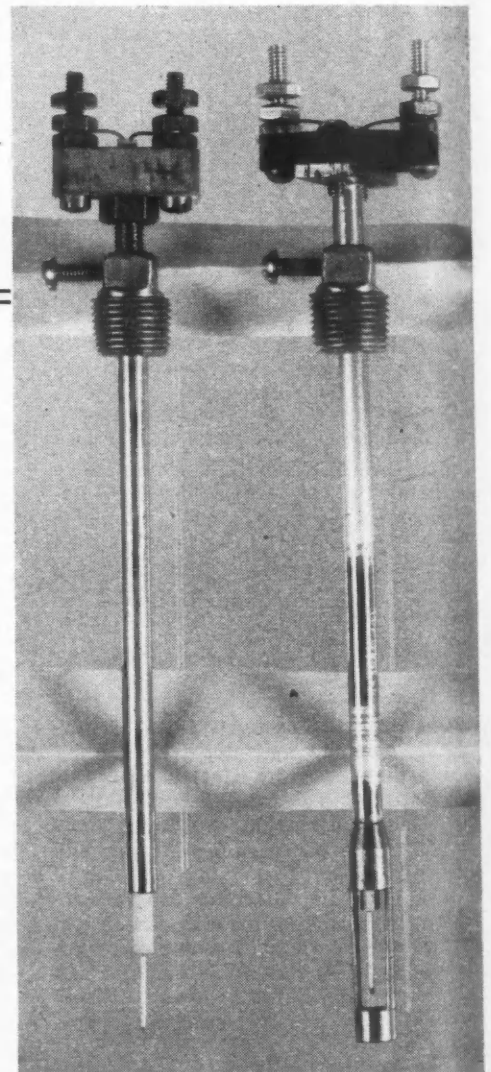
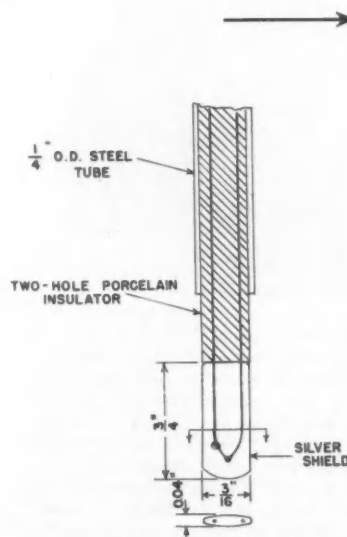


TO JOIN the turbine wheel and shaft of the J33 jet engine now being built by the Allison Division of General Motors, the Taylor-Winfield welder in the above photo goes through three continuous operations in a three min automatic welding cycle. After the two parts are positioned in the machine, the hydraulic-operated carrier brings them together, and about 60,000 amp is passed through the parts. When the temperature reaches 2600 F, the wheel and shaft faces become mushy; and the upset occurs during the last four sec of the cycle under 60,000 amp current and a hydraulic pressure of 240,000 psi. The turbine wheel, made of special cold-forged heat-resisting steel, is 4 in. thick and 18 in. in diam, must withstand temperatures up to 1500 F and stresses resulting from 11,500 rpm. The shaft, made of 4140 heat-treated steel, is 2 ft long and 3 in. in diam. The finished wheel and shaft weigh 214 lb.

New Pyrometer Uses

DEVELOPED by the National Bureau of Standards are these new silver-shielded pyrometers for use in temperature measurements of gas turbines and jet engines. The instrument consists of a steel tube, a porcelain insulator containing the conventional thermocouple wires, and a flattened silver tube 0.75 in. long. The thermocouple junction is inserted 0.50 in. into the silver tube; a thin mica strip is placed on each side of the junction; and the assembly is pressed to form a rigid unit with good thermal contact between shield and junction. This pyrometer, it is claimed, is highly accurate and responsive, and eliminates the radiation of heat to and from a thermocouple junction. Referring to the illustration, the unguarded type gives substantially the same result as the guarded type. The drawing shows a schematic diagram of the components of the unguarded type.

Silver Shield



NEW Products for AIRCRAFT

Three-Purpose Hydraulic Master Cylinder

A new three-purpose hydraulic master cylinder which serves as a vertical pressure cylinder, a fluid reservoir and a brake lock for light aircraft has been



Master cylinder made by Herman Machine and Tool Co.

announced by the Herman Machine and Tool Co., Tallmadge, Ohio.

The cylinder will hold a parked plane without the use of chocks and the parking brake cannot be released accidentally or through vibration of the

plane. Brakes can be locked automatically at any pressure desired and released with a slight pressure on the brake pedal. To lock brakes, the pedal is depressed. Then the lock is applied by pulling a Bowden wire on the instrument panel, operating the locking lever and securing the brakes. Brakes are released by depressing the brake pedal.

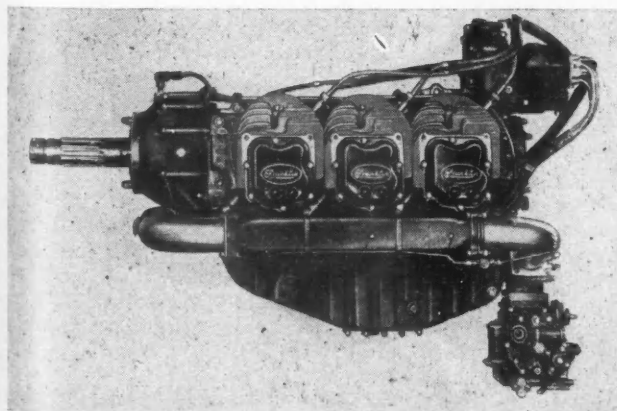
The new cylinder is made of lightweight steel assembled by brazing. Two-thirds of the parts are interchangeable among the various sized models. It can be adapted for use with almost any hydraulic brakes on light aircraft.

Franklin Engine for Convair L-13 Plane

A new Franklin aircraft engine has been designed by Aircooled Motors, Inc., to power the Army Air Force's new liaison plane, the Consolidated-Vultee L-13. Designated by the Army as Model O-425-5, these new engines are now in production in Aircooled Motors' Syracuse, N. Y., plant.

Basically, this engine is similar to Aircooled Motors' models for commercial production, being of the 6-cyl., horizontally-opposed type, aircooled and non-supercharged. Bore is 4 1/4 in. with 4 in. stroke, and total displacement of 425 cu in. It is equipped with propeller reduction gears, with a gear ratio of .623 to 1. Provision is made for a hydraulic governing system for a controllable propeller.

Design speed of the new engine is somewhat higher than for Franklin commercial engines. It is rated at 245 hp at 3300 rpm for takeoff, with a normal rating of 240 hp at 3200 rpm. Total weight of the engine is only 405 lb, about 1.65 lb per hp.

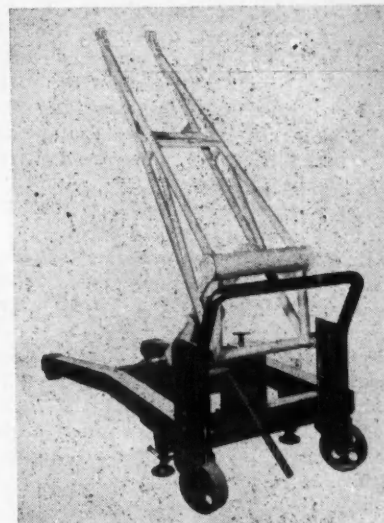


Franklin aircraft engine

A Bendix Stromberg carburetor with idle cut-off is provided. Accessories include dual Scintilla magnetos, starter and generator.

Gear Hoist and Installation Jack

Airquipment Co., Burbank, Calif., has brought out a gear hoist and installation jack which, with the use of adapters available, can be used for lifting complete nose and main landing gear assemblies for installation or removal on the Constellation and DC-4's. Additional adapters now in design or under consideration will further broaden the universal utility of the basic unit to include most of the major types of com-



Airquipment hoist and jack

mercial planes. Even now, the hoist will handle a variety of shop units where dimensions and load limits are within designated requirements. It is capable of lifting 2,400 lb. The boom, with a minimum height from ground of 25 in., can be raised to a maximum height of 7 ft.

The frame is constructed of square steel tubing mounted on two rigid and two swivel casters. Two floor locks hold unit stationary when desired. The movable boom is constructed of tubular steel, pivot-mounted to frame and designed to handle various size gear adapters depending on strut diameter or size of object. The boom is raised or lowered by action of manually operated hydraulic pump.

Two-Element Flight Recorder

A new two-element flight recorder which continuously provides easily read, permanent records of an airplane's flight data has been developed by the General Electric Co., Schenectady, N. Y. The unit will record two variable inputs such as altitude, vertical acceleration, air speed, compass-heading, and

(Turn to page 88, please)

NEW Products

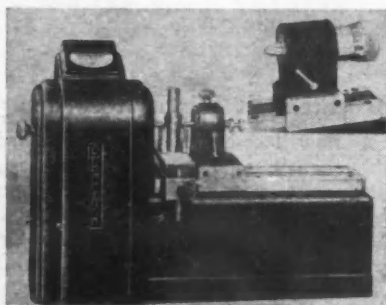
Horizontal Comparator

A new horizontal external comparator for inspection and gage laboratory use has been developed by the Sheffield Corp., 721 Springfield St., Dayton, Ohio. It has a wide range of adjustability—3½ in. in height and zero to 10½ in. in length—which permits the quick, accurate measurement of rectangular, threaded or cylindrical parts, tapered or straight, within its range to millionths of an inch.

Exclusive features include an adjustable pressure attachment, easily-removed elevating table, Sheffield Electrigrage head available in a wide range of amplifications, and the choice of a standard or micrometer tailstock with a large easily-read calibrated barrel.

The flexibility of the instrument allows two methods of set-up and operation. Use of the micrometer tailstock on a range of applications below one in. permits readings of .0001 in. from the calibrated barrel without the use of gage blocks or masters, while if the full accuracy of the instrument is desired, the tailstock may be set at zero, gage blocks used for set-up, and readings in millionths obtained from the Sheffield Electrigrage head. This indicating unit may be obtained in amplifications of 100 to 1, 2500 to 1 or 5000 to 1.

The table is adjustable vertically from zero (center line of gaging anvils) to 3½ in. and is fastened by means of a locking screw. It may be positioned horizontally within a range of 10½ in., and if necessary can be quickly and easily removed. Conveniently located to the left of the indicating unit is the adjustable pressure attachment knob, which is calibrated from 2 oz. to 40 oz.



Sheffield comparator

pressure. This covers the range of 1 lb to 2½ lb. pressure recommended by the National Bureau of Standards for measuring threads by the three wire method.

Bendix-Westinghouse Offers New Slack Adjuster

Designated as Type 15, a new Slack Adjuster has been released by the Bendix-Westinghouse Automotive Air Brake Co. of Elyria, Ohio. Superseding all units within its rated capacity of 15,000 in. lb, this development is said



Bendix Type 15 Slack Adjuster

to raise considerably the efficiency of this method of brake adjustment for commercial vehicles. A much finer setting of the brakes is possible with the new Type 15 Slack Adjuster which features a scientifically ground worm and gear, eclipsing all formerly accepted standards. A sleeve, providing a positive and automatic lock for the adjusting screw, is another improvement and is exclusive with this Bendix-Westinghouse design. A special, heat treated alloy steel is employed in the housing of the Type 15 Slack Adjuster.

High-Pressure Fluid Pumps

Denison Engineering Co., 1160 Dublin Rd., Columbus 16, Ohio, offers a series of high-pressure, high-volume pumps in three sizes. The 3500 Series axial piston, constant displacement type pumps provide 3500 psi for continuous duty operation, and deliver volumes of 6, 17 and 32 gpm at 1200 rpm.

Two types of mountings, foot and



Denison fluid pump

flange, in addition to the face mounting of the pump, provide a variety of methods for the installation of these pumps. They are available in sizes corresponding to the various sizes of the three pumps.

The foot mounting brackets conform to the center line dimension of standard electric motors of the lowest horsepower rating that can successfully be used with these pumps. When larger motors are utilized, the pump is blocked to a comparative level for coupling. A hole in the base of this mounting bracket allows for vertical mounting of the pump's flanges so that, if the pump is mounted directly over the oil reservoir, the suction line may be piped through the bracket to the tank. By this arrangement, it is possible to mount the pump in any of four positions.

Flange mounting plates are available for each of the three pumps and provide a means for the assembly of pump, motor and necessary piping into a single unit. The installation of the motor and pump over the oil reservoir with the pump suspended within the reservoir necessitates the use of a mounting arrangement of this type. The flange mounting is machined for a tight fit between tank and plate and requires only the use of a gasket and mounting cap screws.

Improved Line of Truxmore Third Axles

The Truckstell Co., Cleveland, Ohio, is distributing a new improved line of Truxmore third axles. Manufactured by the Truck Equipment Co., Buffalo, N. Y., the Truxmore third axle increases truck carrying capacity and is claimed to reduce ton-mile hauling costs.

(Turn to page 50, please)

Experience



... an Ingredient of Quality Steel

Planning good steel is one thing . . . science plans your steel at Inland and assures the quality you want. But actually producing good steel is another matter. Something more than sound metallurgical theory is needed—and that something is the experience of men like this . . . men who can melt their skill into every heat. Only such men can turn a metallurgist's formula into good finished steel. At Inland, every ton of steel is produced by master steelmakers who are striving day and night toward the time when every order can be filled completely and without delay.

INLAND STEEL COMPANY

38 South Dearborn Street, Chicago 3, Illinois. Sales Offices: Detroit, Indianapolis, Kansas City, Milwaukee, New York, St. Louis, St. Paul

INLAND STEEL

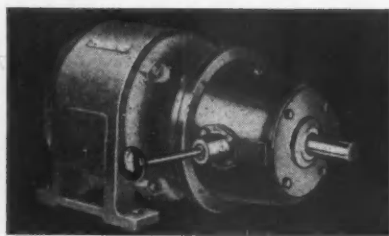
PRINCIPAL PRODUCTS: BARS • STRUCTURALS • PLATES • SHEETS • STRIP
PIPE • PILING • FLOOR PLATE • RAILS • TRACK ACCESSORIES

Improvements on the new 1947 line include a newly designed load shifter and increased cross-shaft bearing areas automatically lubricated from oil reservoirs in the frame brackets. Oilless bearings, lubricated for life, replace ordinary bronze bushings at the ends of the long links. Forgings replace castings wherever possible to increase life and reduce maintenance. Stamped hub caps replace cast hub caps. The brake torque arrangement has a new oscillating bearing.

The Buffalo plant currently is producing series 280 for 8.25 x 20 duals and series 340 for 9.00 x 20 duals. Two larger model axles for 10.00 x 20's and 11 x 20's will go into production soon.

Two-Speed Transmission for Electric Motors

A two-speed motor transmission, a unit that may be used to replace two-speed motors, with the advantage of providing special ratios not obtainable with standard two-speed motors, has been added to the line of the Western



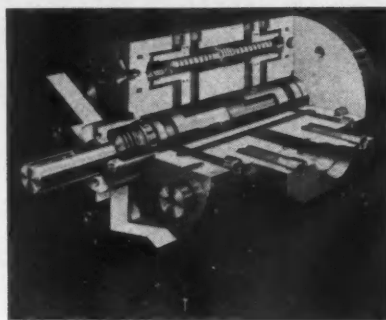
Western motor transmission

Manufacturing Co., 3400 Scotten Ave., Detroit 10, Mich. Direct motor speed, neutral point, and any desired reduction up to 6.25 to 1 are obtained through an automotive-type gear shift lever. Standard reductions are 1½ to 1; 2 to 1; 3 to 1; 4 to 1. Units manufactured to apply on motor frames, Nos. 224, 225 and 254, are mounted upon flanged-type end shield and can be swiveled about on the face of the flange so that the shifting lever may be in any one of three different positions, 90 deg apart (either one of two horizontal and one vertical position). In the larger sizes these new Western two-speed transmissions are made with modified base mounting, corresponding with legs of motor frame.

Hydro-Power Pressure Booster

An oil-hydraulic pressure booster, capable of supplying pressures up to 7500 psi, is announced by Hydro-Power, Inc., Belmont and Sheridan Aves., Springfield, Ohio.

A multi-plunger intensifier, the Hydro-Power booster will multiply by as much as three times the pressure of the oil it handles in a hydraulic circuit.



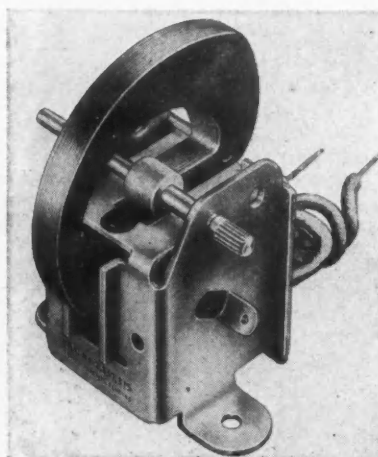
Cut-away view of Hydro-Power booster

The power unit comprises a cylinder block having a nest of six parallel bores, each fitted with a reciprocating, double-acting piston. A central rotating valve member connects the pistons with the source of pressure fluid. As the valve rotates, the oil connections are made successively to the pistons, alternating from one end to the other to provide an uninterrupted pressure flow.

Cylinders are machined from bronze, and are equally spaced around the central rotating valve. Positive clearance is maintained between the valve and body by tapered roller bearing shaft mounting. Pistons are made from hardened and ground alloy steel.

The body of the booster houses the entire assembly and provides a means for porting both suction and discharge. Flanged connections provide a means for connecting the unit to the hydraulic operating system, while the end covers, with feet cast integral, permit mounting of the booster in many positions. A means of maintaining initial preloading without dismantling the booster is provided by a bearing adjusting nut.

Hydro-Power boosters are built in two standard sizes, 35 and 100 gpm input. Each size is available in two distinct pressure ranges: 2½ to 1 and 3 to 1. Volumetric output is in inverse proportion to the pressure ratio. All units have a maximum discharge pressure of 7500 psi.

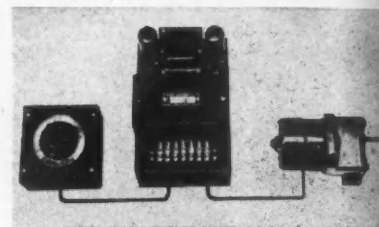


Rotary solenoid made by Radio Condenser Co.

Remote-Positioning Servo Control

The Synchro-Link made by Yardeny Laboratories, Inc., 105 Chambers St., New York, N. Y., is a remote-positioning servo control that will position one or a number of distant motors according to the setting of the control transmitter. It is a packaged unit—the same standard elements are adaptable, without modification, to a number of applications such as control of transmissions, valves, dampers, machine tools, etc.

This device works on the principle of a self-balancing electronic bridge. It consists of three basic elements; the master control with a knob and a calibrated dial for manual control or with a ¼-in. shaft extension for automatic



Synchro-Link

control, the Synchro-Link electronic controller, and the load control potentiometer geared to the motor or coupled to the load.

The motor is not furnished as part of the equipment, but any reversible motor can be used up to the capacity of the controller contacts.

Rotary Power Device

Rotonoid, a power device developed by Radio Condenser Co., Camden, N. J., operates as a solenoid except that it rotates through 180 deg, thereby producing torque instead of a thrust and consequently eliminates the necessity of connecting linkages. The armature of this unit is so designed that it maintains a constant heavy-duty torque throughout its entire 180 deg travel.

The entire unit is self-contained, is approximately 2½ in. by 2½ in. and 3¼ in. in height, and weighs 10 oz. Standard Rotonoid units now in production have a torque of 16 oz in. and can be operated continuously at 20 cycles per minute without exceeding a safe temperature. Where faster action is advisable, they can be used at 60 cycles per minute for periods up to 12 minutes on 115 volt, 60-cycle alternating current.

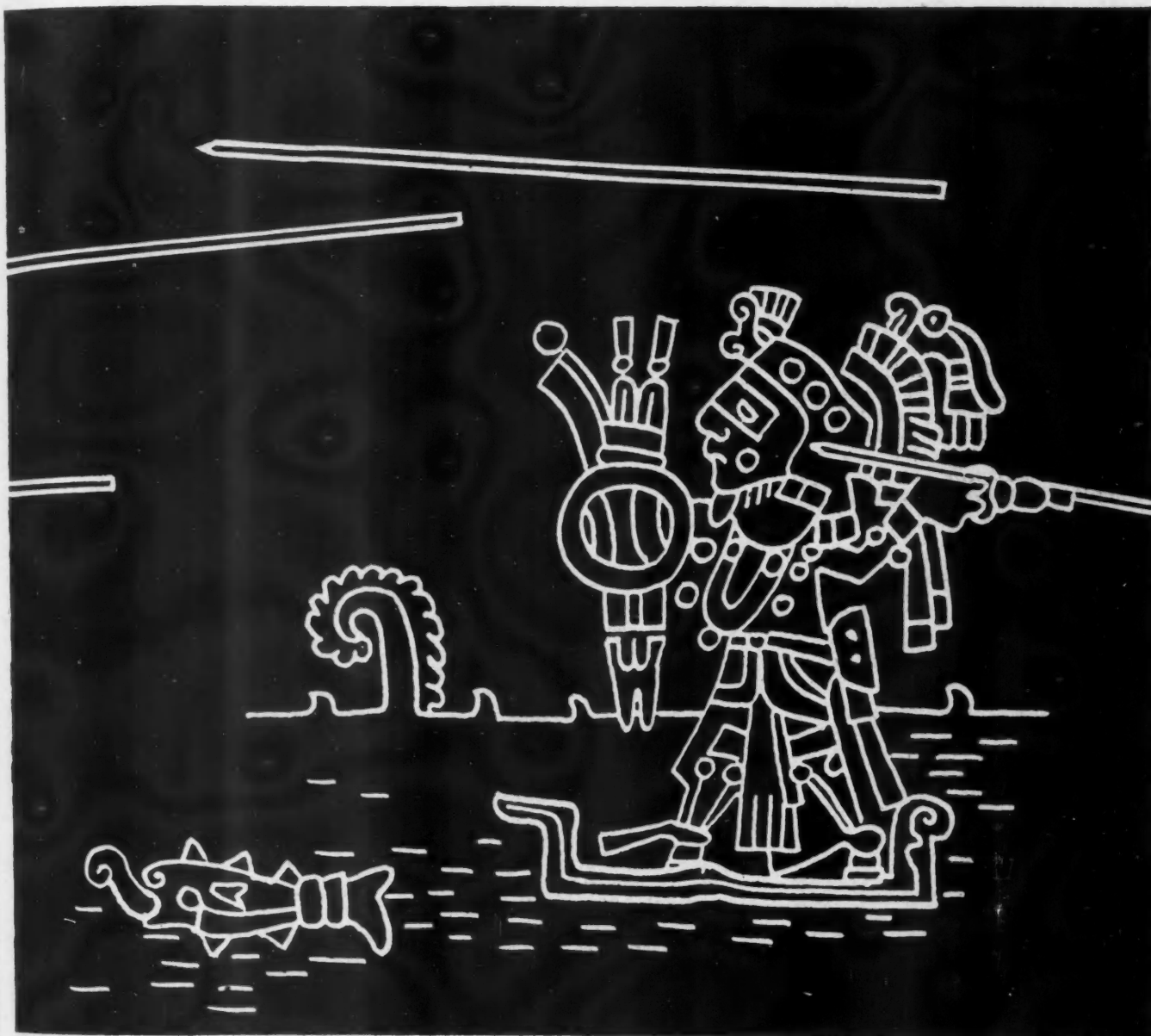
When the Rotonoid is equipped with a current interrupter operating automatically at stroke completion, the temperature rise may be held to a minimum. This means may be employed to energize the coil for the necessary time only. A relay attachment for this purpose is available.

(Turn to page 66, please)

HOW TO MAKE AN ARM GROW

A human arm can throw a spear only so far. But some ancient genius of an engineer figured out that, by employing a throwing stick, which the Aztecs called *atlatl*, the lever of the human arm—and the distance achieved—could be extended, with quite pointed results for an enemy.

Specifying molybdenum in steel is something like using an *atlatl*. For molybdenum extends the usefulness of good steel. By providing good hardenability at low cost, molybdenum steels permit modern engineers to save weight—and costs—in design. It pays to specify molybdenum.



MOLYBDIC OXIDE—BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"
CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

Climax Molybdenum Company
500 Fifth Avenue • New York City

NEWS *of the* Industry

Maintaining Cash Balance Problem for Manufacturers

During the past year several large automotive manufacturers arranged loans of revolving credit with banks. Among them were General Motors, Studebaker, Packard, and Hudson. Recently Kaiser-Fraser Corp. announced it was arranging a \$12 million credit with the Bank of America. Although most of them are operating in the black at present, the automotive manufacturers are finding that unusually high and unbalanced inventories and large payrolls resulting from an excessive number of employees for the number of cars built are causing something of a problem in cash balances. Another factor is that the 38 per cent Federal corporation income tax must be paid in cash quarterly. With large payrolls and heavy investments in inventories that still must be liquidated, it is necessary to have some type of supplementary financing to maintain the required level of operating cash. It is expected that the present unusual situation will clear up over the next year and that stocks of finished vehicles can be moved fast enough to maintain cash reserves at adequate levels.

Automatic Transmissions Still An Uncertain 1948 Optional

One of the most widely discussed topics in the automobile industry today is the possibility that automatic transmission will be included on many 1948 cars as optional equipment. There is considerable second guessing which holds that the automatic transmission will appear on even such lower priced models as Ford, Chevrolet, and Plymouth. Admittedly this development ranks as a top drawer secret among all manufacturers, but all evidence available indicates that chances that the automatic transmissions will be offered on any of the big Three's lower-priced models are not very good at this time. An interesting fact is that the optional cost of the Hydromatic on the Oldsmobile has gone up considerably, which appears to be a significant indication that the cost of manufacturing an automatic transmission is still very heavy. In fact, it is considered much more likely that overdrive will be offered as optional equipment before automatic transmissions become generally available. Apparently there is still some doubt in the minds of many that the automatic transmission has been developed to the point where it will be foolproof enough to offer the public.

Larger Cash Reserves Required by Manufacturers...

Automatic Transmissions as Optional Equipment on 1948

Models Still Uncertain...

Lack of Union Funds Expected to Limit Strikes...

Increased Tooling Costs Reflected in Slight 1947 Model

Changes... Castings May be

Still Greater Material Bottleneck... Guaranteed Annual

Wage Slated for Rough Going in Automobile Industry

... Persistent Upward Creep in Vendor's Prices... Manufacturers

Preparing for More Extensive Advertising.

Union Financial Troubles Indicate Labor Peace

Current developments along the labor front in the automotive industry bolster the current conviction in Detroit that there will be no major automotive strikes this year. For one thing the treasury of the UAW-CIO is not too healthy and the strike fund established last year is definitely in the red. The Union has been paying about \$25 thousand a week to support the strikes against the J. I. Case Co., Racine, Wis., and the Allis-Chalmers Co. at West Allis, Wis. This currently is a heavy drain on the union treasury and accounts for the \$1 special strike fund assessment being levied during February. It is estimated that strikes last year cost the union about \$2 million and that fact, together with the general opposition to strikes among the rank and file, indicates there will not be a repetition of the strike mania which swept all industry last year.

High Tooling Costs Influence Decisions on Model Changes

With Ford about ready to announce its 1947 models, which will carry very few changes, it is evident that tooling costs of 1947 models will be a very small investment. While it is true that all companies decided not to make radical

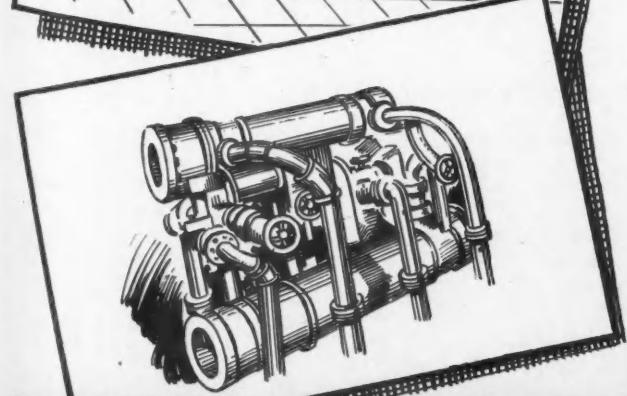
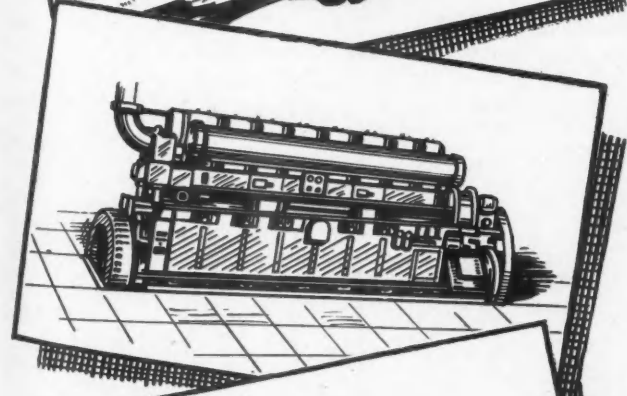
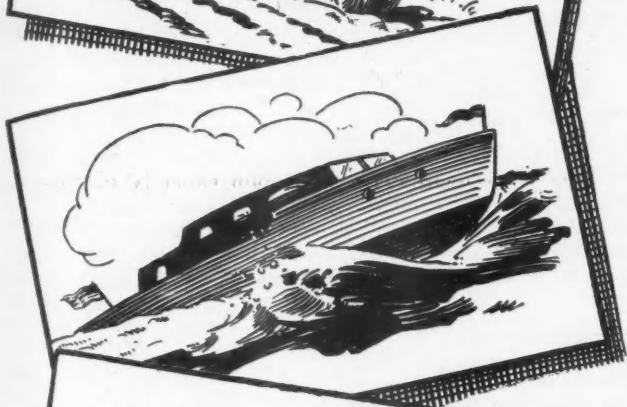
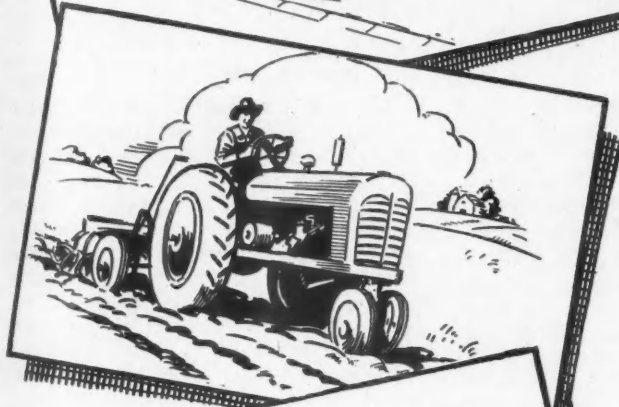
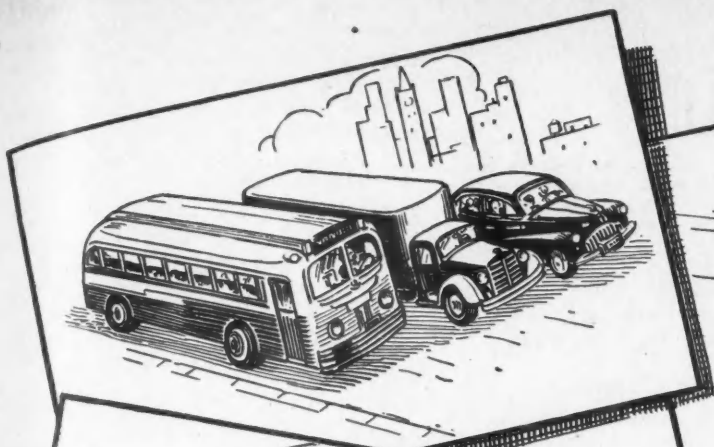
changes because of the loss in time and the lack of the necessity to spur sales, there undoubtedly were other considerations. A major one would be that costs of retooling have risen to monumental proportions as compared to prewar. It is generally estimated that tooling now runs from one to three times the 1941 rate. That may be one of the major reasons why G.M. decided to cancel its die work on certain '48 body types in Chevrolet, Pontiac, and Oldsmobile. It is thought by some industry observers that a dearth of tool and die work may have a salutary effect on that industry and tend to bring prices down to a more reasonable level. It would not be impossible for G.M. to start a new die program for 1948 models, but so far there has been no indication that this is the case.

Castings May Prove Bottleneck When Steel Supply Is Adequate

Some automotive industry leaders are indicating that the next major materials bottleneck may come in the field of castings. While at present the limited supply of steel determines the top level of production, there is some belief that if the steel supply improves, the foundry industry will not be able to keep pace and castings may be the limiting factor in automotive production. Principal troubles now are lack of adequate supply of pig iron, high price and uncertain quality of scrap, poor quality coke, and a potential lack of manpower. As a result of these conditions, not only is output limited, but the percentage of scrap castings caused by poor material and green labor is scandalously high. Even with the job situation tightening up considerably, it is still difficult for foundries to obtain adequate manpower.

Annual Wage Uncertain In Automobile Industry

The guaranteed annual wage, an objective dear to the hearts of union leaders, seems slated for rough going in the automobile industry. John Bugas, vice-president in charge of industrial relations for Ford, stated recently that the company views the annual wage demand as one very difficult and probably impossible to achieve because of seasonal sales demand for automobiles. While the demand will continue to be pressed, there is not very much to support the union contention that it can be granted now or any time in the immediate future, and the general opinion
(Turn to page 78, please)



Four For All!

PERMATEX offers you these four top-notch, anti-corrosive, assembling compounds as the answer to your production and maintenance problems! Each one has valuable characteristics that make it best for certain types of assemblies!

- Form-A-Gasket No. 1, a paste...sets hard.
- Form-A-Gasket No. 2, a paste...sets pliable.
- Aviation Form-A-Gasket, a liquid...sets tacky.
- Pipe Joint Compound, a liquid...sets flexible.

All of these Permatex assembling compounds make pressure - tight unions . . . leak - proof to gasoline, kerosene, fuel oil, diesel oil, hot or cold lubricants, hot or cold water, salt water, illuminating gas, glycerine and numerous other liquids and gases!

Descriptive literature on request.



PERMATEX COMPANY, INC., BROOKLYN 29, N. Y.

PUBLICATIONS AVAILABLE

Publications listed in this department are obtainable by subscribers through the Editorial Department of AUTOMOTIVE and AVIATION INDUSTRIES. In making requests give title above the item concerning the publication desired, the date of issue in which it appeared, your name and address, company connection and title.

36—High Speed Steel Welding Rods

The Welding Equipment & Supply Co.—6-page illustrated folder gives physical properties, heat-treatment and uses of the Eureka No. 2 High Speed Steel Welding Rods. Welding procedures are outlined in using these rods for repairing high speed steel cutting tools, for compositely fabricating cutting tools for creating cutting, wearing and bearing surfaces.

37—Maintenance of General Purpose Turbines

Westinghouse Electric Corp.—Booklet B-3747 gives practical information necessary for the proper maintenance of general purpose turbines. It describes the steam turbine, explains how it operates and tells how it should be installed. Directions for piping, joint sealing and lubricating are given. Repairs and adjustments are discussed and the final chapter gives emergency hints for quick reference.

38—Small Hydraulic Couplings

Twin Disc Clutch Co.—Latest issue of Production Road gives the complete story of the company's new product, a small Hydraulic Coupling, which has been successfully tested on electric motors and internal combustion engines, 1 to 25 hp range. Short illustrated articles describe six of the major advantages derived by teaming the small hydraulic coupling with power units.

39—Automatic Temperature Control Systems

Wheelco Instruments Co.—Educational Bulletin No. 5 contains charts, tables and diagrams explaining measure and automatic control and the selection of proper control systems for process applications.

40—Ram Type Milling Machines

The Van Norman Co.—Bulletin on No. 22L and 22M Ram Type Milling Machines, containing complete information and specification data on these two new machines. It describes construction and operation features as well as simplicity of control. The machines are illustrated and the bulletin also contains pictorial description of the various attachments available.

41—Polishing Machinery

Hammond Machinery Builders, Inc.—Catalog No. 55 describes the company's new polishing machinery. It gives

specifications on the line of polishing and buffing machinery as well as the new VROL Variable Speed Lathe.

42—Automatic Clamping

The National Automatic Tool Co., Inc.—12-page illustrated booklet describing production with NATCO automatic clamping, for fixtures in connection with automatic processing machines for drilling and tapping.

43—Speedomax Pyrometers

Leeds & Northrup Co.—16-page illustrated catalog, Speedomax Type G Pyrometers. Illustrations in the catalog show the construction of balancing motor, slidewire and vacuum-tube amplifier unit. A schematic diagram illustrates the essentials of this balance-type instrument.

44—High Strength Steels

Republic Steel Corp.—20-page booklet profusely illustrated describing the purpose, properties, composition, application and performance of the three high strength steels produced by the company—Republic Aldecor, Cor-Ten and Double Strength.

45—Time Saving Tools

Crozier Machine Tool Co.—New illustrated 12-page catalog describes the features and operation of Crozier time-saving tools, including various models of the vacuum-grip speed lathe for odd shaped parts that cannot be held by chuck or collet.

46—Caterpillar Diesels

Caterpillar Tractor Co.—20-page color booklet, Caterpillar Diesels at Work in Industry describes the use of

Diesel-powered tractors on various jobs requiring mobile, flexible power. The booklet contains many action photographs to illustrate its informative text.

47—Bushings

Ex-Cell-O Corp.—Bulletin 11882-B contains information on sizes under A.S.A. standards and prices on drill jig bushings. Other important bushing information is also contained in the bulletin.

Chevrolet Plant at Flint to Open Next Month

The new Chevrolet assembly plant at Flint, now under construction, probably will not get into operation until mid-March, according to latest estimates. Originally it was scheduled for operation about the first of the year, and then about the first of February, but building delays have required a further deferment. Capacity of the plant will be about 800 units a day on one shift operation and about 1300 on two shifts. Assembly now is carried on in plants at Norwood, Ohio, Baltimore, Oakland, Calif., Tarrytown, N. Y., St. Louis, and Jaynesville, Wis. When the Flint plant and a new assembly unit at Van Nuys, Calif., are in operation, Chevrolet will have a maximum capacity of close to 9000 units a day when operating two shifts. However, no plants now are on a two-shift basis, and there is little likelihood of enough materials to make that possible for several months yet.

Weekly Production of Cars and Trucks in U. S. and Canada

Week-ending	1947	Corresponding Week in 1941
Jan. 4.....	53,437	76,090
11.....	64,823	115,935
18.....	75,166	124,025
25.....	93,278	121,948
Feb. 1.....	94,111	124,400
8.....	90,995	127,675
Total.....	471,813	689,023

General Motors Production of Motor Vehicles

United States and Canadian Factories

Total GM Corp.	By Months		
	1947	1946	1941*
January	123,152	17	247,449
February	3	234,212
March	755	255,849
April	77,114	262,628
May	95,666	242,986
June	89,739	252,084
July	119,057	230,809
August	145,199	29,838
September	137,807	109,555
October	172,030	193,458
November	174,181	182,195
December	174,489	119,596
Total	1,186,057	2,360,659

2,093,936

How these 2 Steels will meet 95% of your Alloy Steel Needs!

for heat treated gears, bolts, shafts, etc.

Now, from the maze of alloy steels available, it is easier for you to select the grade best suited to your needs. In handling most of your jobs these Carpenter Chrome-Nickel Alloy Steels will reduce your inventory, simplify your problems of selection and fabrication wherever they are used.



For more details about these steels and the many jobs they can do... ask your Carpenter representative for the new folder, "2 Steels Simplify Your Alloy Needs."



Carpenter No. 5-317 CHROME-NICKEL ALLOY STEEL	
The Triple Duty Alloy Steel With Special Finish	
✓	Tested for Impact Strength
✓	Low Hardening Temperature
✓	Uniform Hardenability
✓	High Yield Point
✓	Aircraft Quality
✓	Acid-Disc Inspected
✓	Closely Controlled Chemistry
✓	Made by Cold Melt Electric Furnace Process
✓	Inspected by Tool Steel Quality Standards
✓	Free from Decarburization and Surface Defects

Available **NOW** from
Your Carpenter
Warehouse

BUFFALO CHICAGO
CINCINNATI CLEVELAND
DAYTON DETROIT
HARTFORD PROVIDENCE
NEW YORK ST. LOUIS
INDIANAPOLIS



Carpenter No. 158 CHROME-NICKEL ALLOY STEEL	
The Finest in Case Hardening Steels	
✓	Uniform Hardenability
✓	Acid-Disc Inspected
✓	Aircraft Quality
✓	Closely Controlled Chemistry
✓	Guaranteed Fine Grain
✓	Made by Cold Melt Electric Furnace Process
✓	Inspected by Tool Steel Quality Standards

Carpenter

SPECIAL PURPOSE



ALLOY STEELS

... made in a tool steel mill
... inspected by tool steel standards.



THE CARPENTER STEEL COMPANY • 103 W. BERN STREET, READING, PA.

February 15, 1947

When writing to advertisers please mention AUTOMOTIVE and AVIATION INDUSTRIES

55

PERSONALS

Recent Personnel Changes and Appointments at the Plants of Automotive and Aviation Manufacturers and Their Suppliers.

The Studebaker Export Corp.—**Mel S. Brooks** has resigned as vice-president.

General Motors Corp., Chevrolet Motor Div.—**E. J. Leonard**, Manager of Market Analysis and Sales Research Dept.

General Motors Corp., Pontiac Motor Div.—**D. J. Dunlop**, Asst. to General Manufacturing Mgr., **S. W. Ostrander**; **Buell E. Starr**, Manufacturing Mgr.; **Ray J. Longpre**, Production Mgr. in chg. of Material Dept., Parts Warehouse and Traffic and Central Stores.

General Motors Corp., Pontiac Motor Div.—**R. R. Hutchinson**, Asst. Chief Engineer. **A. C. Ditz** and **E. W. Norman** appointed Asst. General Sales Mgrs.

General Motors Corp., Allison Div.—**Don R. Berlin** has resigned as Director of Installation Engineering.

Ford Motor Co.—**William T. Gossett**, appointed Vice-President and General Counsel.

Ford Motor Co.—Lincoln Div.—**Charles S. Brown**, Purchasing Agent.

Ford Motor Co.—**Paul J. Kaniut**, Chief Pilot and Supervisor of aircraft and landing field operations.

The White Motor Co.—**Richard W. Shanklin**, Sales Mgr., Wholesale Div.

Fargo Motor Corp., Fleet Sales Div. of Chrysler Corp.—**N. W. Seidel**, Director of Field Operations, and **William**

J. Bird, Divisional Operating Manager.

Curtiss-Wright Corp.—**Elmer R. Bayless**, Manager of new Parts Dept., to handle sale and delivery of spare parts.

Bendix Aviation Corp., **Frederic G. Muller**, resigned as public relations director, Teterboro, N. J.

Bendix Helicopter, Inc.—**Peter N. Jansen**, elected executive vice-president.

Air Associates, Inc.—**Lieut. General Barney M. Giles**, appointed as head of engineering division.

Goodyear Aircraft Corp.—**Paul F. Scheiderer**, Personnel Mgr.

Aircooled Motors, Inc.—Three new members of the Board of Directors are **W. Wallace Kellett**, **Livingston Platt** and **Joseph W. Powell**.

Norton Co., Grinding Machine Div.—**Everett M. Hicks**, Asst. Manager.

The Timken-Detroit Axle Co.—**Fred W. Parker**, Asst. to the President. **Kenneth P. Hayes**, Director of Service.

Cummins Engine Co., Inc.—**V. E. McMullen**, Executive Vice-Pres.; **R. E. Huthsteiner**, Vice-Pres. and General Mgr.

Eaton Manufacturing Co., Axle Div.—**Stewart Walls**, Factory Manager, and **C. C. Wickson**, Plant Supt.

Federal-Mogul Corp.—**K. W. Warren**, Sales Manager, and **Thomas J. Marshall**, Asst. Sales Manager.

Elastic Stop Nut Corp.—**John R. Munn**, Chairman of the Board of Directors; **William F. McGuinness**, President, and **Gregory Oberst**, Treasurer.

The Reliance Electric & Engineering

Co.—**Fred E. Harrell**, Manufacturing Vice-President.

Morse Chain Co.—**John A. Comstock**, Engineer of Materials, Ithaca, New York, plant.

Service Station Equipment Co.—**H. P. Forton**, Manager of Sales.

H. K. Porter Co., Inc.—**Colonel G. deFreest Larner**, elected a director.

Ethyl Corp.—**Russell B. Weston**, Advertising Manager

Vanadium Corp. of America—**John B. Girdler**, Asst. General Manager.

International Nickel Co. of Canada, Ltd.—**H. J. French**, Asst. Vice-President.

United States Rubber Co., Fisk Tire Div.—**J. W. Timmons**, Manager, Fisk Farm Tire Sales.

Joseph T. Ryerson & Son, Inc.—**Charles S. Hegel**, Mgr., Stainless Steel Div.; **John W. Queen**, Mgr., Alloy Steel Div.; **G. Van Dyke**, head of Ryerson Special Steels Div., has retired.

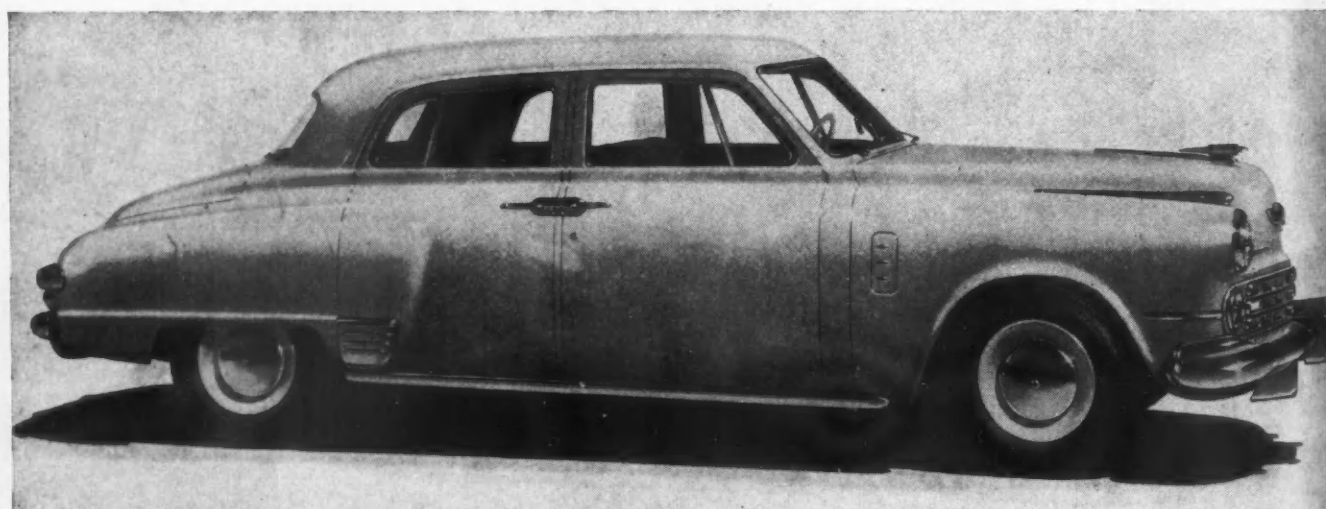
The American Coach & Body Co.—**Harvey F. Berghaus**, elected to Board of Directors as Vice-President in charge of manufacturing.

American Brake Shoe Co., Brake Shoe & Castings Div.—**Stephen S. Conway**, Vice-President of Sales Dept.

Motor Wheel Corp.—**Byron L. Ballard**, **Donald F. Valley** and **F. Carew Martindale**, elected to Board of Directors. **M. F. Cotes** has been appointed executive vice-president.

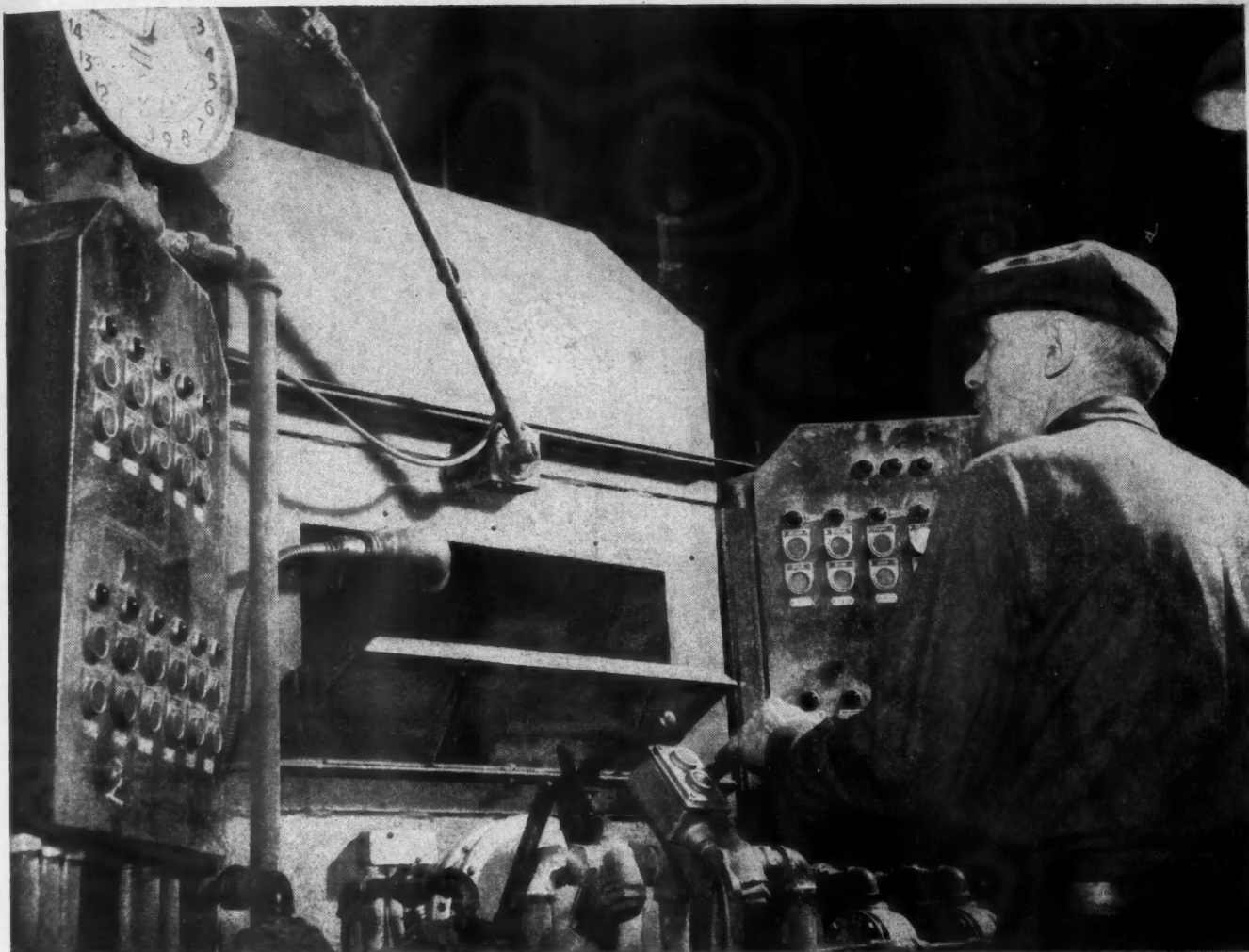
Dravo Corp., Machinery Div.—**D. R. Berg**, Mgr. of Heating and Combustion Sections.

Studebaker Land Cruiser



This new four-door sedan has just been added to Studebaker's line of passenger cars. Although the wheelbase is four inches longer than any other 1947 Studebaker model, particular emphasis has been placed on de luxe appointments.

These include adjustable rear compartment ventilation windows, assist straps, leather robe rails, scuff pads, wrapped spring cushion foundations, and electric clocks. Hill-holders and oil filters also are standard equipment.



At this control station molding sand is blended to produce smooth, perfect castings. Sand must be tested every 15 minutes.

*To help make
your good engines
even better...*



SEALED POWER has been working 35 years to bring plants and personnel to today's peak—the finest in our long history—the finest in the piston ring industry. During that time our success has been due in no small measure to the generous collaboration of leading automotive engineers. Let us use the experience, the laboratory facilities, the technical skill of the Sealed Power staff to help make your good engines even better!

SEALED POWER CORPORATION
MUSKEGON, MICHIGAN • STRATFORD, ONTARIO

Keep Your War Bonds!
Get \$4 for \$3!

SEALED POWER PISTON RINGS
PISTONS—CYLINDER SLEEVES

Business in Brief

Written by the Guaranty Trust Co.,
New York, Exclusively for AUTO-
MOTIVE and AVIATION INDUSTRIES

Continuing minor fluctuations in general business activity are indicated. The *New York Times* index for the week ended Jan. 25 stands at 148.5, as against 148.9 for the preceding week and 114.2 a year ago.

Sales of department stores during the week ended Jan. 25, as reported by the Federal Reserve Board, equaled 220 per cent of the 1935-39 average, as compared with 223 per cent in the week before. Sales were 17 per cent above the corresponding distribution a year earlier, as against a preceding similar excess of 17 per cent. The total in 1947 so far reported is 28 per cent greater than the comparable sum in 1946.

Electric power production increased slightly in the week ended Jan. 25. The output was 20.4 per cent above the corresponding amount in 1946, as compared with a like advance of 17.2 per cent shown for the preceding week.

Railway freight loadings during the same period totaled 821,964 cars, 0.7 per cent less than the figure for the week before and 16 per cent above the corresponding number in the preceding year.

Crude oil production in the week ended Jan. 25 averaged 4,671,550 barrels daily, 47,600 barrels less than the preceding average and 45,250 barrels below the comparable output in 1946.

Production of bituminous coal and lignite during the week ended Jan. 18 is estimated at 13,225,000 net tons, 3.8 per cent below the output in the week before. The total production in 1947 so far reported is 2.2 per cent above the corresponding quantity in 1946.

Civil engineering construction volume reported for the week ended Jan. 30, according to *Engineering News-Record*, is \$94,514,000, or 28 per cent above the preceding weekly figure and 35 per cent above the comparable sum in 1946. The total recorded for five weeks of this year is 24 per cent more than the corresponding amount in 1946. The increase in private construction is 18 per cent, and the rise in public construction is 36 per cent.

The wholesale price index of the Bureau of Labor Statistics for the week ended Jan. 25 is 140.3 per cent of the 1926 average, as compared with 140.8 for the preceding week and 106.8 a year earlier.

Member bank reserve balances declined \$184,000,000 during the week ended Jan. 29. Underlying changes thus reflected include an increase of \$313,000,000 in Reserve bank credit and a rise of \$674,000,000 in Treasury deposits with Federal Reserve banks, accompanied by a reduction of \$104,000,000 in money in circulation.

Total loans and investments of reporting member banks decreased \$231,000,000 during the week ended Jan. 29. An increase of \$55,000,000 in commercial, industrial and agricultural loans was recorded. The sum of these business loans, \$10,499,000,000, shows a net increase of \$3,199,000,000 in twelve months.

1946 Motor Vehicle Factory Sales

From U. S. Plants
(Automobile Manufacturers Association)

	Passenger Cars	Trucks	Buses	Total
January.....	58,367	44,994	467	101,828
February.....	57,784	34,914	285	92,983
March.....	85,810	37,836	527	123,973
April.....	132,631	80,762	948	214,341
May.....	168,942	75,373	789	245,104
June.....	141,090	60,038	774	201,902
July.....	209,180	87,454	862	297,496
August.....	247,261	97,881	1,067	346,209
September.....	232,280	95,658	833	328,771
October.....	283,586	107,154	975	391,719
November.....	269,081	100,892	1,146	371,115
December.....	266,665	107,983	1,438	376,086
12 Months.....	2,148,677	930,739	10,091	3,089,507

Factory Sales to Domestic and Foreign Markets

	Passenger Cars		Trucks		Buses	
	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign
January.....	53,441	2,926	37,931	7,063	436	31
February.....	54,111	3,673	26,708	8,206	230	35
March.....	80,239	5,571	29,095	8,541	443	84
April.....	125,785	6,866	62,520	18,242	854	94
May.....	158,344	8,598	59,947	15,426	741	48
June.....	131,284	9,806	50,247	9,791	751	23
July.....	195,158	14,022	72,008	15,446	833	29
August.....	229,083	18,178	78,283	19,598	867	200
September.....	218,645	13,835	77,477	18,181	758	75
October.....	263,236	20,350	88,195	18,959	923	62
November.....	250,379	18,702	79,101	21,791	1,102	44
December.....	244,931	21,734	83,098	24,885	1,339	99
12 Months.....	2,004,616	144,061	744,610	186,129	9,277	814

Motor Truck Factory Sales by Gross Vehicle Weight

From Plants Located in United States

Month	5000- Less	5,001- 10,000	10,001- 14,000	14,001- 16,000	16,001- 19,500	19,501- 26,000	Over 26,000	Total
January.....	18,535	3,877	9,058	8,499	1,607	2,136	1,282	44,994
February.....	13,758	3,100	9,436	4,624	1,151	1,760	1,085	34,814
March.....	16,821	2,002	8,451	7,791	411	1,223	937	37,836
April.....	26,925	5,013	29,795	14,669	1,711	1,691	958	80,762
May.....	26,209	5,833	22,884	15,835	2,002	1,729	1,081	75,373
June.....	32,890	4,795	12,754	5,555	1,556	1,469	1,019	60,038
July.....	30,617	7,125	23,214	21,572	2,259	1,753	914	87,454
August.....	34,987	6,744	28,281	23,189	1,853	1,858	969	97,881
September.....	32,581	9,188	28,687	20,074	2,068	2,076	988	95,658
October.....	35,921	14,745	26,659	21,754	3,082	3,387	1,606	107,154
November.....	30,483	12,424	22,971	27,438	3,377	2,878	1,321	100,892
December.....	31,003	13,389	25,722	29,774	3,087	3,292	1,716	107,983
12 Months.....	330,730	88,235	247,912	200,574	24,182	25,252	13,874	930,739

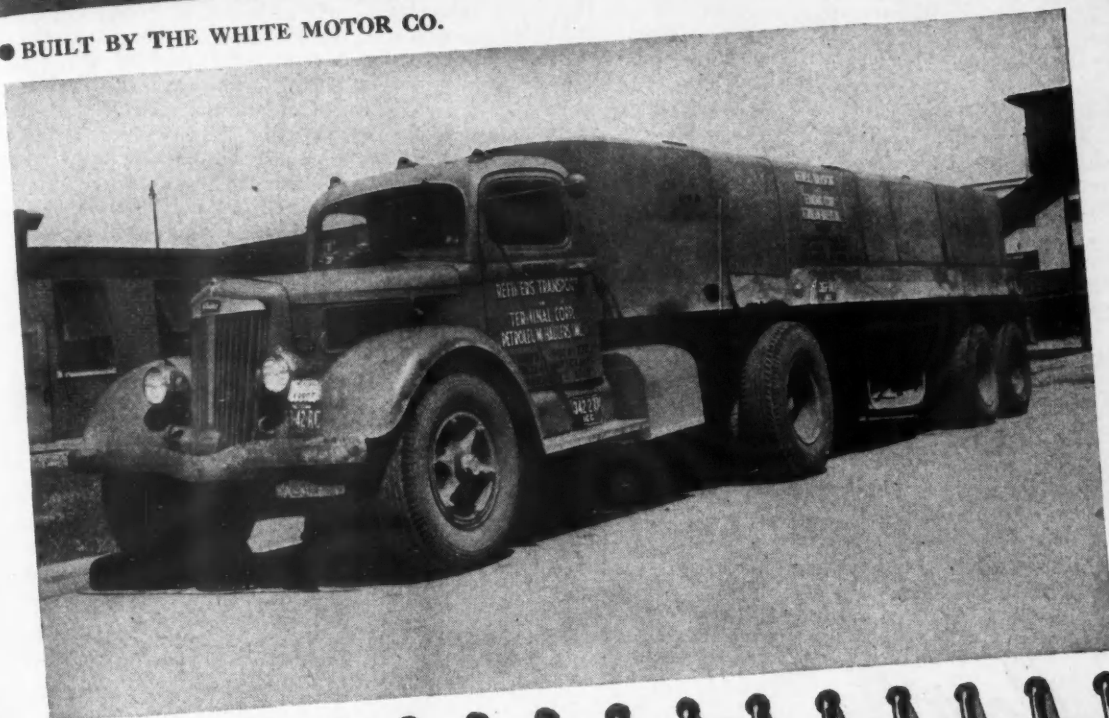
1946 New Passenger Car Registrations*

November and Eleven Months 1946 Compared with 1941

MAKE	November 1946	October 1946	November 1941	Eleven Months		Per Cent of Total Eleven Months	
				1946	1941	1946	1941
Ford.....	36,323	41,871	26,690	287,614	574,990	18.67	18.17
Chevrolet.....	46,814	41,516	35,794	286,235	845,186	18.63	23.77
Plymouth.....	19,534	21,212	17,187	192,133	432,312	12.47	12.15
Dodge.....	12,992	13,181	9,647	121,136	204,973	7.86	5.76
Buick.....	20,481	20,049	14,917	102,822	291,667	6.67	8.20
Pontiac.....	18,682	16,968	13,338	93,302	271,462	6.06	7.63
Oldsmobile.....	15,316	13,899	10,980	74,884	216,907	4.86	6.15
Nash.....	9,583	8,636	3,215	74,082	74,205	4.81	2.09
Hudson.....	7,962	7,234	3,152	64,047	69,366	4.18	1.95
Chrysler.....	6,191	6,277	5,458	56,833	137,466	3.82	3.86
Mercury.....	8,997	8,846	4,435	52,335	77,486	3.40	2.18
Studebaker.....	6,906	7,353	5,696	49,594	107,264	3.22	3.02
De Soto.....	4,693	4,810	3,898	49,138	87,140	3.19	2.45
Packard.....	5,240	4,579	4,773	30,966	65,029	2.01	1.83
Cadillac.....	3,965	3,131	3,545	19,026	56,956	1.23	1.60
Lincoln.....	1,662	1,437	1,098	9,023	17,515	.59	.49
Crosley.....	724	616	72	1,988	1,030	.13	.03
Kaiser.....	876	133	.....	1,014	.....	.07	.....
Willis.....	762	219	733	1,003	21,140	.06	.59
Frazier.....	613	119	.....	737	.....	.05	.....
All Others.....	108	74	119	549	2,684	.04	.06
Total.....	230,424	225,180	164,747	1,540,461	3,556,978	100.00	100.00

*—Data from R. L. Polk & Co.

● BUILT BY THE WHITE MOTOR CO.



Cutting Costs

With the Right Bearings!

Moving oil around the country is only one of many tough jobs assigned to SKF-equipped trucks. Some convey loads of rock and coal. Others move lumber and paper. And still others carry iron bars and other heavy materials. But no matter how tough the job, their SKF Bearings easily carry radial and thrust loads . . . combine proper alignment with quiet performance

and long gear life. If you want bearings that will help you reduce the mileage costs of your trucks—that will be instrumental in keeping your trucks on schedule, check the trade-mark. Three letters "SKF" mean the right bearing in the right place. 6183

SKF INDUSTRIES, INC.
Front St. & Erie Ave., Philadelphia 32, Pa.



NMTBA to Hold Show at Dodge-Chicago Plant

The 1947 Machine Tool Show, World's largest exposition of a single basic industry, will be held in Chicago from Sept. 17 through 26, according to an announcement by Herbert H. Pease, president of the National Machine Tool Builders' Association.

The latest designs in metal-working machinery—new methods, new materials and new products—and every development that improves quality of durable-goods production—will be shown. Theme of the show is "More goods for more people at lower prices."

The gigantic show will occupy 500,000 sq ft in the Dodge-Chicago plant, near the Chicago airport. Lease for the space, part of the 94 acres of the plant which was built during the war, has been taken by the Association from the War Assets Administration and the Tucker Corp., who now occupy the plant.

More than 250 exhibits, of machine tools, forging machines and other metal working equipment will be shown in operation in the largest industry exposition ever held.

Admission will be by invitation. For the convenience of visitors, advance registration will be arranged by the

Association, through its offices at 10525 Carnegie Ave., Cleveland 6, Ohio.

Each day during the nine days of the Show the doors will be open from 10:00 a.m. to 5:00 p.m. In the evening there will be technical sessions of the Machine Tool Congress at various Chicago hotels, headquarters for the participating organizations.

Directors of the NMTBA are Herbert H. Pease, Alexander G. Bryant, Lloyd D. McDonald, Louis Polk, Harry W. Bockhoff, Albert M. Johnson, William L. Dolle, Fred W. McIntyre, and Herbert L. Tigges.

The members of the Machine Tool Show Committee are Swan E. Bergstrom, Chairman; William L. Dolle, R. W. Glasner, Helge G. Hoglund, Ralph J. Kraut, Donald M. Pattison, and Louis Polk.

Three previous shows have been held by the Association. These took place in Cleveland, Ohio, in 1927, 1929 and 1935.

THE MARK OF
MOTOR DEPENDABILITY...

Lamb Electric
MOTOR



Compactly designed motor developed for metering pump and special instrument service.



Heavy-duty universal motor with in-built spur gear reduction.

Exacting manufacture backed by thorough engineering gives Lamb Electric Motors the long, trouble-free operation imperative for satisfactory product performance. Because of this standard of dependability, Lamb Electric Motors are being used in more and more of America's finest products.

THE LAMB ELECTRIC COMPANY
KENT, OHIO

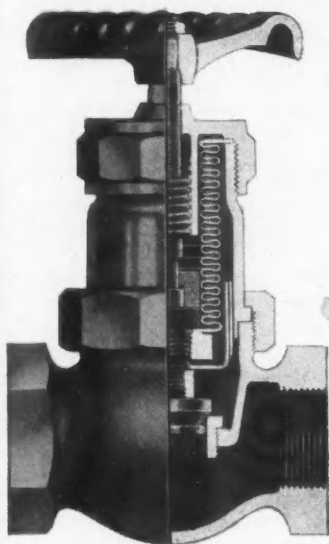
Lamb Electric
Black & Decker Electric
FORMERLY **SPECIAL APPLICATION FRACTIONAL HORSEPOWER MOTORS**

CALENDAR

Conventions and Meetings

- Amer. Soc. for Testing Materials—Spring Mtg. Phila. Feb. 24-25
- Amer. Soc. of Mechanical Engineers—Spring Mtg., Tulsa. Mar. 2-5
- Amer. Soc. of Lubrication Engineers—Annual Convention, Pittsburgh, Mar. 17-19
- Amer. Soc. of Tool Engineers—Fifteenth Annual Convention — Houston, Texas Mar. 19-22
- Amer. Soc. for Metals, San Francisco, Mar. 22-27
- Midwest Power Conference, Chicago, Mar. 31-Apr. 2
- Midwest Power Conference, Chicago, Mar. 31-Apr. 2
- Nat'l Assoc. Corrosion Engineers, National Convention, Chicago.... April 7-10
- Soc. of Automotive Engineers, Aeronautic Mtg., New York April 9-11
- Soc. of Automotive Engineers, Transportation Mtg., Chicago..... April 16-18
- Chamber of Commerce of the United States, Annual Mtg., Washington, D. C. Apr. 28-May 1
- Amer. Foundrymen's Association, Annual Convention, Detroit.. Apr. 28-May 1
- Soc. of Automotive Engineers, Personal Airplane Mtg., Wichita, Kansas, May 1-2
- The Society of the Plastics Industry, Nat'l. Plastics Exhibition, Chicago, May 6-10
- Soc. for Experimental Stress Analysis Annual Mtg., Chicago..... May 15-17
- Nat'l Assoc. of Motor Bus Operators Annual Mtg., Chicago..... May 21-23
- Auto. Engine Rebuilders Assoc. Convention, Detroit May 22-24
- Amer. Soc. of Mechanical Engineers—Oil & Gas Power Nat'l Conference—Cleveland May 21-24
- Amer. Soc. of Mechanical Engineers—Aviation Mtg., Los Angeles.. May 26-29
- Metal Powder Assoc., Spring Mtg., New York May 27
- Soc. of Automotive Engineers—Summer Mtg. French Lick Springs, Ind. June 1-6
- Amer. Soc. of Mechanical Engineers—Semi-Annual Mtg., Chicago.. June 16-19
- Amer. Soc. of Testing Materials—Annual Mtg., Atlantic City..... June 16-20
- Soc. of Automotive Engineers—West Coast Transportation & Maintenance Mtg., Los Angeles.... Aug. 21-23
- Amer. Soc. of Mechanical Engineers—Fall Mtg., Salt Lake City.... Sept. 1-4
- Society of Automotive Engineers—Tractor Mtg., Milwaukee.... Sept. 17-18

*Handling a
Hazardous
Liquid?*



No. 304-N Sylphon Packless Valve comes in sizes from 1/2" to 2" for liquid pressures up to 150 lbs. Also available in larger sizes is No. 1304 with flanged connections for liquid pressures up to 80 lbs.



PROTECT YOURSELF WITH SYLPHON PACKLESS VALVES

● Fulton Sylphon packless valves, installed on pipe lines carrying oil, gasoline and other hazardous liquids, protect you and your equipment against the danger of leaks . . . even little ones.

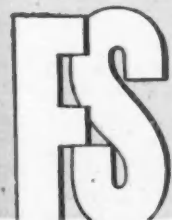
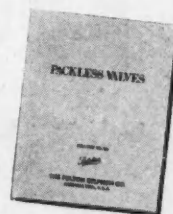
Secret of their unvarying effi-

ciency is the dual-ply Sylphon seamless bellows which provides a perfect seal. Made of special composition metal, these bellows replace customary packing and eliminate the disadvantages of packed type valves.

Designed for use aboard ships, in rayon plants, power plants, or wherever steam, air, gases or liquids

are handled, these rugged, reliable packless valves have proved their superiority in both industrial and marine service.

Bulletin CB-313, prepared especially for engineers, designers and builders, gives complete information. Send for it today.



FIRST WITH BELLOW

THE FULTON SYLPHON CO. KNOXVILLE 4, TENN.

FULTON SYLPHON

Temperature Controls • Bellows • Bellows Assemblies

Canadian Representatives, Darling Brothers, Montreal

What's Needed to Solve Labor Problems

(Continued from page 42)

an effort has been made to settle the issues through collective bargaining and after a conciliator has been called into the case, unions authorizing such strikes should be subject to injunction on the demand of the employer, and the employees engaging in such strikes should be subject to the loss of their legal status as employees. Jurisdictional disputes to enforce featherbedding as

a compromise over the question of which union's members should perform the work should be illegal.

8. Forbid Featherbedding

The policy of business and industry must be one of vigorous competition and aggressive application of technological improvements. Unions must not be allowed to get in the way of such progress. Over the years better tools and better methods have made possible more production with the same amount of human effort. We all know that a truck driver can earn more and can be paid more than a teamster. We know that a man with a bulldozer or coal-

cutting machine can earn more and can be paid more than a man with a pick and shovel. The reason men can be paid more when working with superior tools is only because they accomplish more useful work. This is the way we have raised the standard of living of our country. We can all have more only when we produce more.

If technological improvements are to produce the greatest good for the greatest number, the benefits of such improvements must be broadly distributed to all of us as customers. The advantages of technological improvements can be dissipated by artificial restriction of output below normal working capacity. Featherbedding must be discouraged and must not be protected by law. Recent demands for portal-to-portal pay throughout industry really put featherbedding on a mass production basis. In this particular case the usual demands for "more money for less work" reached an all-time high of "more money for no work at all."

9. Clarify Strike Procedure

The organization of unions for collective bargaining under law with the strike privilege implies that there will be some strikes and that they will be legal strikes. Laws covering collective bargaining should specify that if agreements are reached they must contain provisions defining conditions under which legal strikes may occur. If employees take part in strikes in violation of collective bargaining agreements, such employees should immediately lose their legal status as employees.

In the case of lawful strikes not only the parties involved but the public generally may be injured by such strikes. Before employees strike, all provisions of the collective bargaining procedure should be exhausted. Conciliation should be accepted by both parties if requested by either party. A strike vote should be taken only after clear statements of the issues still in dispute have been made to the employees by both the union and the employer. In this way the employee would know exactly what he is voting for, realizing that he is making the decision whether to accept the last offer of the employer or go out on the street.

10. Stop Abuse of the Strike Privilege

The privilege of striking has been recognized as proper action for employees to take when they consider that as a group they are being exploited or are not receiving fair treatment in regard to wages, hours and working conditions.

It was never intended that this privilege should be used as a means of aggression against all other citizens. It is comparable to the basic right that all nations have to defend themselves against aggression, as compared to the development of a military machine for the purpose of aggression against other nations.

General strikes or national strikes
(Turn to page 64, please)



DOLE Thermostats

IN A RANGE OF TYPES
FOR EVERY CAR



In cars of advanced design—it is certain that positive motor temperature control will continue to be a highly important factor in achieving top-flight performance. Controlled cooling is the prime function of DOLE Thermostats...They provide quicker warm-up—plus substantial savings in gas, oil and motor wear.

THE DOLE VALVE COMPANY
1901-1941 Carroll Avenue • Chicago 12, Illinois
Los Angeles • Detroit • Philadelphia



this is



the old way...

When you use SEMS on your assembly line you eliminate the wasteful motions involved in putting the washer on the screw and then carefully positioning the assembled pieces for driving. SEMS bring you both washer and screw pre-assembled as a single unit . . . ready for one easy motion from pan to driving position. There's no "fumbling" when you do it the SEMS way for the washer can't fall off!

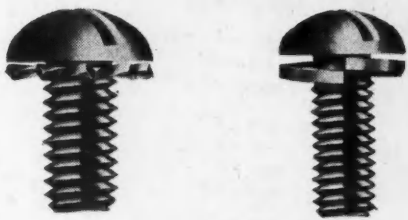
Send for samples today and conduct your own demonstration. See for yourself how SEMS reduce costs by simplifying and speeding production and at the same time provide quality control because the worker can't "forget" the washer.

this is the SEMS way



use

SEMS



the **MODERN**
fastener unit

SEMS are Pre-Assembled Washer and Screw Units in which the Washer is held on the Screw by the Rolled Thread and is free to rotate.

SEMS ARE AVAILABLE FROM THE FOLLOWING MANUFACTURERS

Continental Screw Co.
New Bedford, Mass.

The Lamson & Sessions Co.
Cleveland, Ohio

Pheoll Manufacturing Co.
Chicago, Illinois

Shakeproof Inc.
Division of Illinois Tool Works
Chicago, Illinois

American Screw Co.
Providence, R. I.

Corbin Screw Division
American Hardware Corp.
New Britain, Conn.

National Lock Co.
Rockford, Illinois

Russell, Burdall & Ward
Bolt & Nut Co.
Port Chester, N. Y.

Steel Co. of Canada, Ltd.
Hamilton, Ont., Canada

Central Screw Co.
Chicago, Ill.

Don Manufacturing Co.
Reliance Division
Massillon, Ohio

The National Screw & Mfg. Co.
Cleveland, Ohio

New England Screw Co.
Keene, N. H.

Scovill Manufacturing Co.
Waterville Division
Waterville, Conn.

Stronghold
Screw Products Inc.
Chicago, Ill.

Chandler Products Corp.
Cleveland, Ohio

affecting the health and safety of the people or the economic security of great numbers of citizens not directly involved in the dispute immediately become a challenge to Government, which has the responsibility of maintaining law and order and protecting the interests of all citizens. Our labor laws and the legislative and judicial procedures to be followed must be clarified so that a situation like that which developed in the recent coal strike would not have to be resolved by the chance technical maneuver of accusing a labor leader of being in contempt of court. Clearly no pressure group can be allowed to challenge the supreme power

of Government. The legal procedure through which this power of Government is to be exercised must be clearly defined and understood by all.

Used Car Dealers Oppose Compulsory Car Inspection

In the wake of proposed legislation which would require periodic safety examinations of motor vehicles, the Michigan Used Car Dealers Association has announced it is actively opposed to the measure. The association fears that such state testing divisions would deteriorate into politically corrupt bu-

reaus. A spokesman also states that such a law would make it possible for "alley" garages to prey on motorists in the immediate vicinity of testing stations. However, other observers point out that such a law has worked well elsewhere and it is merely a question of setting up an effective system with adequate control of abuses. The used car dealers undoubtedly are influenced to some extent in their opposition by the fact that they themselves would be subject to inspection of cars on their lots and have a possible fear that their reconditioning costs might be increased by making it necessary to have all cars pass inspection before sale.

Automotive Manufacturer Joins Fight on Regulation W

Pressure is increasing from all sides against Regulation W, the Federal Reserve Board credit control regulation. At least one automotive manufacturing representative, H. C. Doss, General Sales Manager for Nash, has joined with new and used car dealers in asking that the regulation be revoked. Doss's action is just one more bit of evidence that automotive manufacturers fear the present high prices of automobiles are a definite threat to volume sales. Loosening of credit regulations to allow smaller down-payments and extension of the financing period to 24 instead of 15 months would put off the day when purchasers would refuse to buy at present levels. In any event, it now is expected that Congress will not extend the consumer credit powers of the Reserve Board when they expire at the end of June so, in all possibility, Regulation W will be dead by July 1.

A Worker Wakes And Worries

A letter appearing in the Public Letter Box of a Detroit newspaper may or may not be significant, but it indicates at least a bit of thinking by an unidentified union member. The letter states, "Fourteen thousand workers" (at Hudson Motor Car Co.) "were sent home for two days because of discipline applied to one steward. With a loss of over \$200,000, 95 per cent of the workers did not want to go home, but because of the incompetence of one man, we lost 12 hours' work. Since V-J Day, we have lost a quarter of our wages because of incompetent union officers and ignorant stewards. Wake up, fellows. Let's get a new bunch of officers and stewards before it is too late."

Union to Sue Ford For Vacation Pay

The UAW-CIO has announced that it intends to file suit against Ford Motor Co. for approximately \$3 million in vacation pay for World War II veterans. The suit will contend that Ford must consider time spent in the armed forces as job seniority in computing vacation pay.



- Buell Air Horns are tops in warning signal efficiency.
- Installed as original equipment on many Trucks and Buses.
- They reduce maintenance costs by decreasing stops, starts and slowdowns.
- All records prove that they save tires, brakes, clutches and gears.
- Cut gas and oil consumption.

With a Buell the driver has greater security, maintaining a steady cruising speed. Slowing a 20 ton load from 50 MPH to 30 MPH means destroying a lot of energy thru brake lining and tires. It is replaced by burning more gasoline, increasing load on engine, and tires again, to regain speed. This all costs money. We believe a Buell Air Horn is worth \$100.00 yearly on any heavy highway vehicle. Then remember a Buell will last more than 10 years. How would you rate a \$100.00 investment that earned \$100.00 yearly for 10 years. Ask the man who has a Buell.

BUELL AIR COMPRESSOR

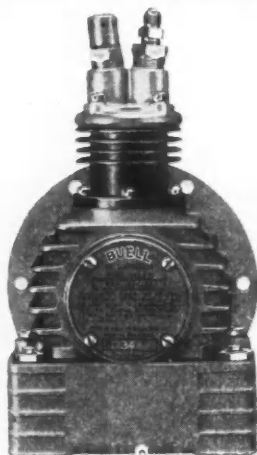
- Used on Passenger Cars, Trucks, Buses, Boats and Planes.
- Small and compact in size . . . efficient and powerful in action.

Buell engine-driven compressors supplied air to operate air brakes in thousands of R.C.A.F. aircraft. Only a combination of quality and precision workmanship could meet the requirements of this type of service.

Designed for compactness and light weight, they are far more efficient and powerful than their size indicates. Let us prove their adaptability to your needs.

BUELL MANUFACTURING CO.

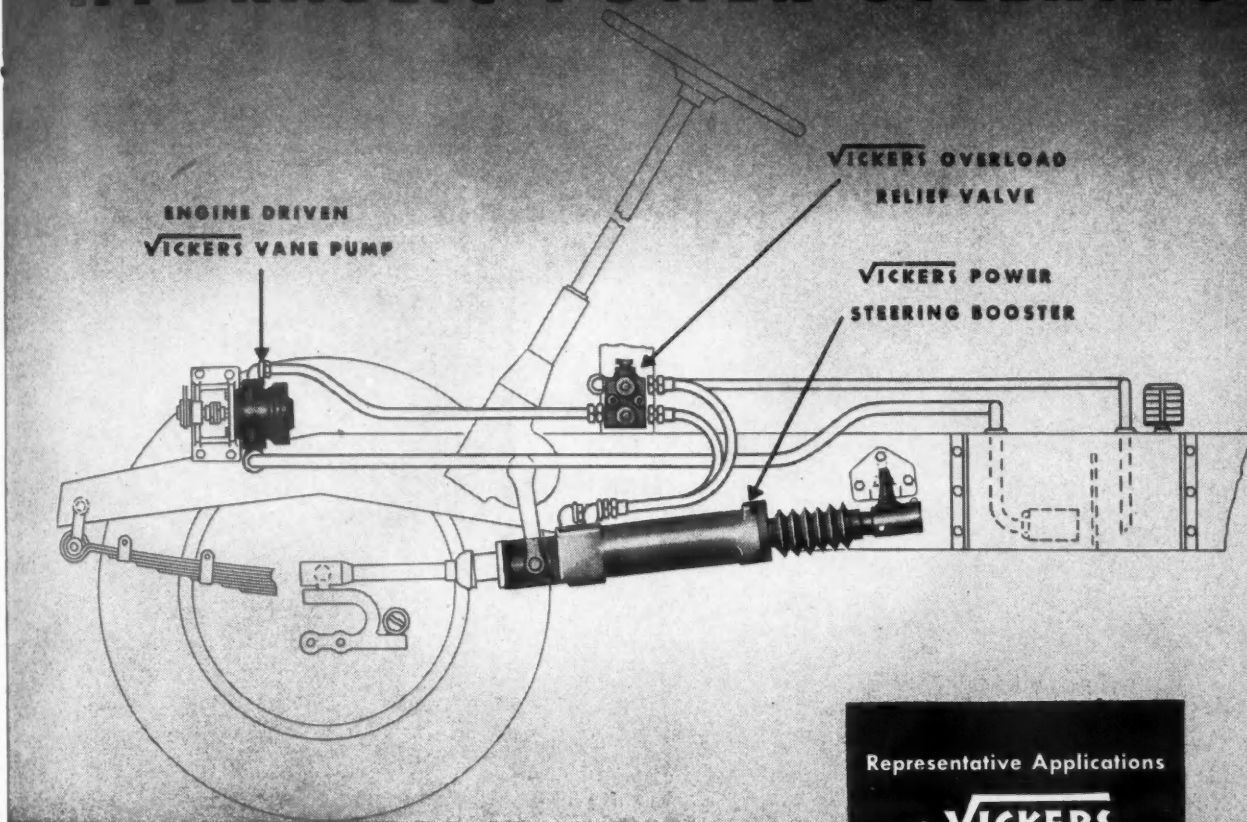
2975 Cottage Grove Ave., Chicago 16, Ill.



COMPACT.

Another Important
Advantage of

VICKERS HYDRAULIC POWER STEERING



Requiring only a minimum of space for installation, the Vickers Hydraulic Power Steering System can be applied to most existing hand steering mechanisms with a few simple alterations. The separate power cylinder (booster) can be located where it does not interfere with other apparatus and where the power will be applied directly to (and in line with) the drag link. No additional space is required at the end of the steering column where space is usually at a premium.

Other important advantages of Vickers Hydraulic Power Steering are: effortless, positive and shockless steering . . . road shock thrusts are transmitted to the frame of the vehicle instead of to the steering gear . . . automatic overload protection . . . reduced operator fatigue . . . greater road safety . . . automatic lubrication . . . and 15 years of successful operating experience. Bulletin 44-30 gives complete information about Vickers Hydraulic Power Steering; write for a copy.

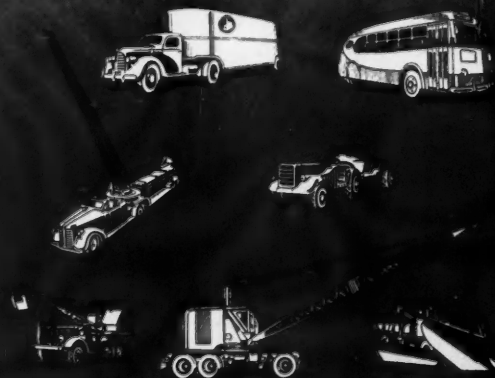
VICKERS Incorporated

1428 OAKMAN BLVD., DETROIT 32, MICHIGAN

Application Engineering Offices: CHICAGO • CINCINNATI • CLEVELAND • DETROIT
LOS ANGELES • NEWARK • PHILADELPHIA • ROCHESTER • ROCKFORD
TULSA • WORCESTER

Representative Applications

of **VICKERS**
HYDRAULIC
POWER
STEERING



February 15, 1947

When writing to advertisers please mention AUTOMOTIVE and AVIATION INDUSTRIES

Confident POWER



MARVEL-SCHEBLER
Carburetor

FOR LIGHT AIRCRAFT

MARVEL-SCHEBLER CARBURETOR DIV.
BORG-WARNER • • FLINT 2 MICHIGAN

New Products

(Continued from page 50)

Firestone Producing Wire Cord Tire

Substituting high tensile steel wire for cotton and rayon cord, the Firestone Tire and Rubber Co. is now in production on a wire cord tire.

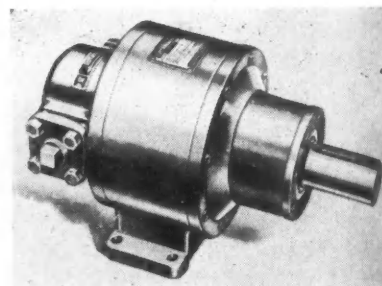
The present wire cord tire is built up of plies of rubberized wire cord in the same manner as the conventional cotton or rayon cord. With the exception of the original ply preparation, the same machinery and fundamental tire building methods are used. However, because of the greater strength of the wire cord, fewer plies are required than with cotton or rayon.

The wire cord is but .036 in. in diameter. It is composed of several strands of wire .0058 in. in diameter, twisted together.

The promising possibilities of the wire cord tire for punishing off-the-highway service are said to be fundamentally due to three characteristics of the metallic cord: High sustained strength under high temperatures; negligible stretch under load; the ability, as the result of the greater conductivity of the wire construction, to dissipate heat away from the normally vulnerable points.

Small Hydraulic Pump for Extreme Pressures

Superdrdraulic Corp., Miller at Ford Rd., Dearborn, Mich., has brought out a hydraulic pump that develops 5000 psi, yet is only six in. in diameter and



Superdrdraulic Junior model pump

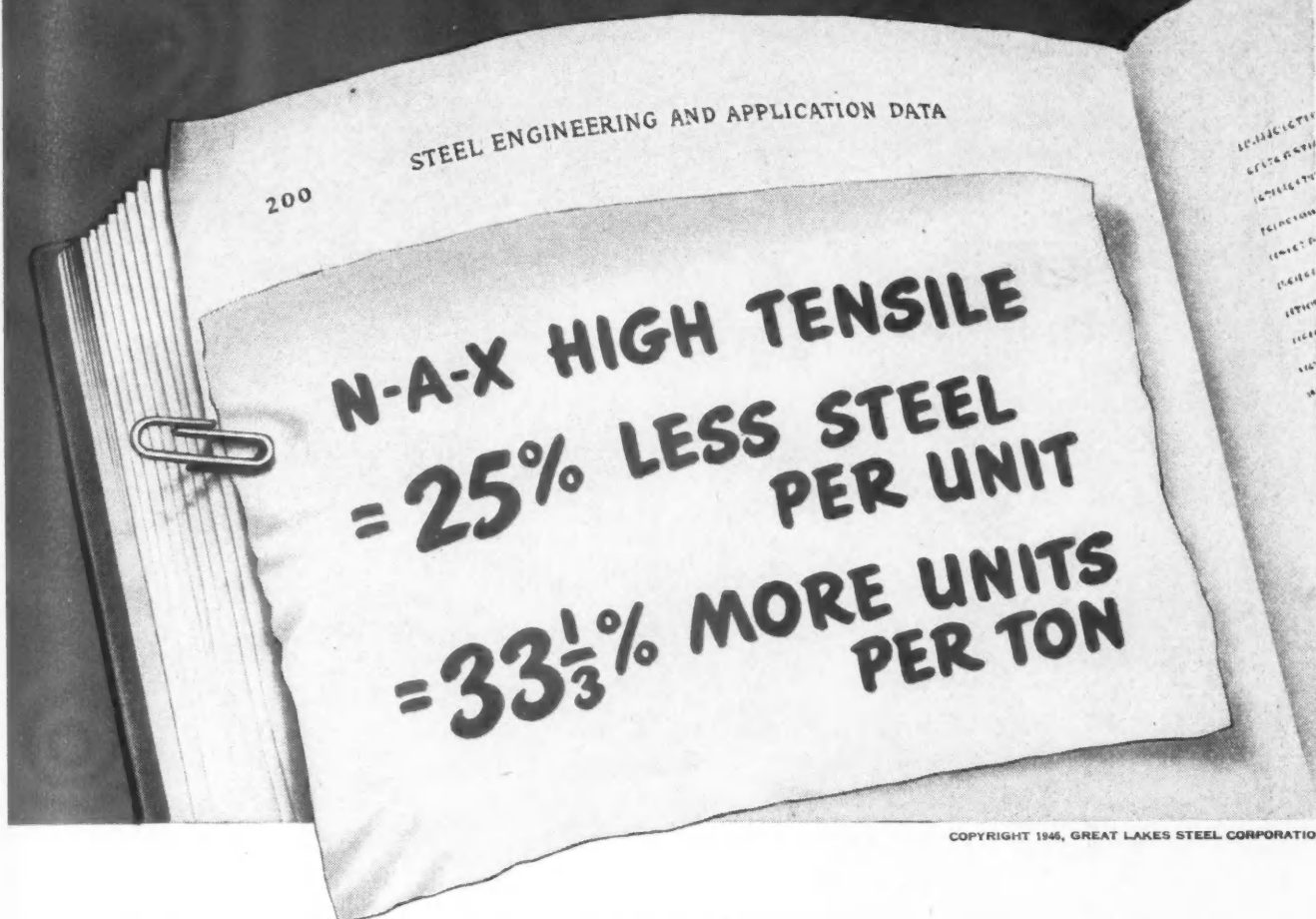
11 in. long. Known as the "Superdrdraulic Junior" model it weighs 35 lb and is only slightly more than half the size of Superdrdraulic's Senior model.

The single bank of plungers delivers three gpm at 1800 rpm or two gpm at 1200 rpm. Volumetric efficiency is said to be 95 per cent with the lightest hydraulic oils. The radial, multi-plunger design provides smooth delivery.

The new pump has a wide range of applications and is particularly adaptable as a holding pump for presses

(Turn to page 68, please)

THE NEW ARITHMETIC IN STEEL



COPYRIGHT 1946, GREAT LAKES STEEL CORPORATION

You can make more and better products per ton by replacing carbon sheet steel with N-A-X High-Tensile

Today, many manufacturers are enjoying the important production advantages brought by N-A-X HIGH-TENSILE steel.

Because of its greater strength, toughness, fatigue and corrosion-resistance, this low-alloy, high-tensile steel ordinarily permits reduction in sectional thickness of as much as 25%. This means 33 $\frac{1}{3}$ % more units per ton of steel—with actual improvement in the strength and durability of finished products. And because N-A-X HIGH-TENSILE steel has exceptional ductility for high-strength steel, it can be deep-drawn and formed into intricate shapes.

In addition to the savings in steel provided by N-A-X HIGH-TENSILE, economies in handling, fabri-

cating and finishing operations can often be effected.

Tomorrow, N-A-X HIGH-TENSILE will be available in ever greater quantities and to a wider field of users. Even though current production can't always keep pace with demand, our engineers will be glad to show you how helpfully N-A-X HIGH-TENSILE steel can fit into your future production picture.

MAKE A TON OF SHEET STEEL
GO FARTHER

Specify—



GREAT LAKES STEEL CORPORATION

N-A-X ALLOY DIVISION • DETROIT 18, MICHIGAN
UNIT OF NATIONAL STEEL CORPORATION

and plastics injection molding machines. The Junior pump may also be used as a powerful reversible hydraulic motor.

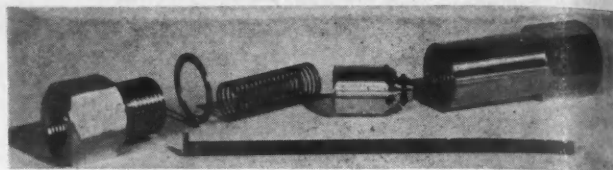
Double-Seal Check Valves

A new check valve placed on the market by Mansfield & Green, 4601 Euclid, Cleveland, Ohio, includes a double seal which eliminates leakage and loss of pressure even with grit in the system. With grit .010 in. in diameter the valves are said to show no leakage or seepage at any pressure to 10,000 psi.

This double seal principle utilizes a

*Check valve made
by Mansfield &
Green*

metal to metal seat plus a resilient rubber or synthetic rubber ring seal on the check valve poppet. The line pressure forces the resilient ring to the metal seat which force increases with increase of pressure resulting in greater sealing force at higher pressures.

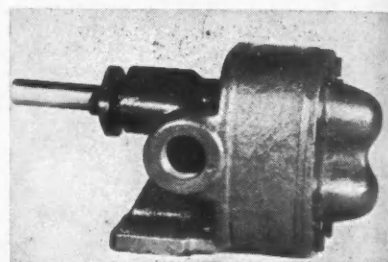


The valves are available in sizes ranging from 1/8 in. to 1 in. SPT, for pressures to 10,000 psi, and any media not destructive to rubber or synthetic rubber.

General Service Rotary Pumps

A line of general service pumps, the GA rotary type, has been added to the line of Worthington Pump and Machinery Corp., Harrison, N. J. Six sizes are available in various mountings for capacities up to 51 gpm and 100 psi.

Design features of these small-ca-



Worthington general service pump

capacity rotary pumps include four-bearing construction and special herringbone rotors. Built-in pressure lubrication eliminates all external lubrication and the danger of liquid contamination.

Models are available foot mounted or flange mounted with adjustable stuffing box and mechanical seal. They are also available with or without oversize unloader type relief valve. All models are suitable for direct coupling to electric motors of any make.

Air Briefs

(Continued from page 32)

Airport. Dr. T. P. Wright, Administrator of Civil Aeronautics, is not completely "sold" on either system and feels that an huge investment in either system at this time would be unwise in view of the many extremely promising systems now under study. The seriousness of the problem requires thorough study of these many systems with a careful eye on the long-range promise of all-weather scheduled airline flying. By making comparatively modest investment in installations throughout the country while pressing research and experiment on new systems, installing them as they are perfected at strategic airports, Dr. Wright believes the best possible all-weather flying equipment will be provided the United States at a minimum of expense and in the least practicable time.



clip this coupon for FREE sample!

CENTRAL EQUIPMENT CO., 902 S. Wabash Ave., Chicago 5, Ill.
We should like to have a FREE sample of your new, powerful, mechanically perfect hose clamp with the push plus pull action ... also Bulletin No. 2147 that tells all about it.

NAME OF COMPANY _____
ADDRESS _____

CENTRAL EQUIPMENT CO.
902 S. WABASH AVENUE
CHICAGO 5, ILL.

THIN WALL BEARINGS and BUSHINGS

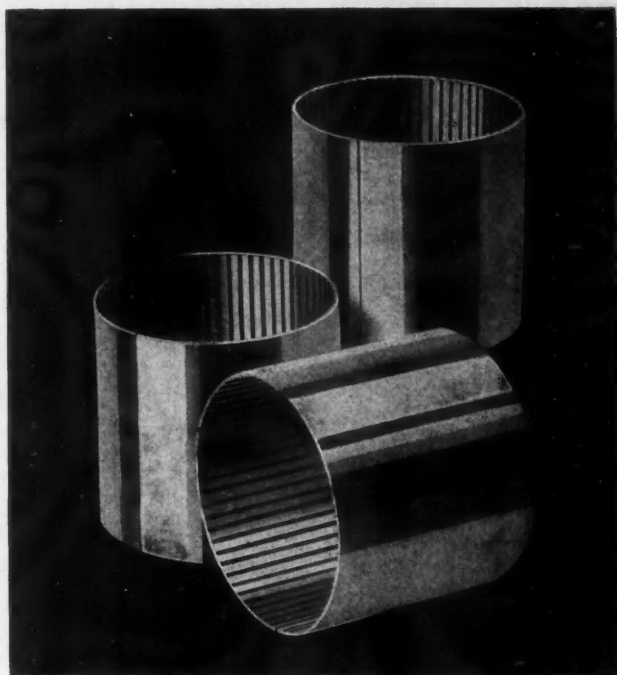
Thin wall bearings, which includes a thickness range of $\frac{1}{32}$ " to $\frac{7}{64}$ " are growing in popularity every day. And rightly so. Engineers and designers appreciate the many distinct advantages such as compactness, extra strength and resistance to pounding plus the comparatively low cost. Excellent delivery is now available on these three types...

Rolled Bronze

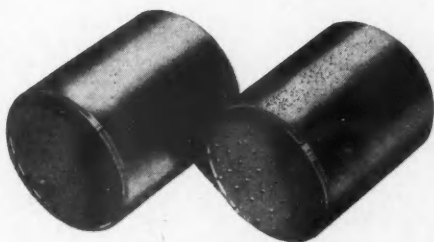
Available in two alloys... Johnson No. 40—copper 90; tin .5; zinc 9.5 and Johnson No. 44—copper 88; tin 4; zinc 4. Either of these two alloys will provide excellent bearing characteristics and are low in cost, particularly on long runs. Any type oil groove, slot or oil hole can be secured and the bearings can be graphited or ball indented for grease.

Steel and Babbitt

A distinct favorite with builders of internal combustion engines. The famous Johnson Slip-in Bearings are steel and babbitt, now used on so many popular makes of automobiles. The babbitt is permanently bonded to the steel thus assuring long life, smooth operation with a low coefficient of friction.



Pre-Cast Bearing **Bronze on Steel**



Write today for complete, technical data on all types of Sleeve Bearings. It's FREE!

A new and unusual bearing material that combines the excellent bearing characteristics of a high grade bronze alloy with the strength of steel. Its use permits you to increase speeds and loads... to gain longer bearing life with smooth operation... plus greater resistance to shock and wear.

Pre-cast Bearing Bronze-on-Steel was developed primarily for sleeve bearings but it also fills many other important applications in industry. It is ideal for stampings, washers, guide strips and other flat pieces. For such purpose we can supply it, promptly, in coils with a maximum width of $5\frac{1}{2}$ " and a range of thickness from $\frac{1}{32}$ " to $\frac{3}{32}$ ".

Call in your local Johnson Bronze representative. Permit him to show you how you can use Thin Wall Bearings to your advantage.

JOHNSON

SLEEVE BEARING

625 S. MILL STREET

The MOST COMPLETE SLEEVE BEARING SERVICE in the WORLD

BRONZE

HEADQUARTERS

NEW CASTLE, PA.

THE BOARDLESS "BOARD DROP HAMMER"



NO BOARDS • NO BELTS • NO MOTORS

NEW!

Announcing
the

CHAMBERSBURG

CECO-DROP

REG. U. S. PAT. OFF.

CHAMBERSBURG Engineering Company marks its 50th Anniversary with the introduction of a new gravity drop hammer that represents a tremendous advance in drop forging practice. Designed for work customarily assigned to the board drop hammer, the CECO-DROP will out-produce any existing gravity drop hammer.

Eliminating boards, the CECO-DROP lifts the ram by means of air or steam, holds it by a simple ingenious clamp and drops it by an air valve operated by foot treadle. Performance records to date show at least 10% more forgings than on conventional gravity drop hammers, with simplicity, safety and low maintenance as additional features.

Write for descriptive bulletin

CHAMBERSBURG ENGINEERING COMPANY
Chambersburg, Pa.

CHAMBERSBURG

Builders of **IMPACT** Machinery

1897 • Fiftieth Anniversary • 1947

Supersonic Age Visualized

(Continued from page 31)

in cooperation with the American Helicopter Society, Ralph P. Lightfoot, Chief of Flight Research, Sikorsky Aircraft Div., United Aircraft Corp., described the system of analyzing flight test data which was used to demonstrate the performance and airworthiness of the S-51 helicopter to the Civil Aeronautics Administration. Other papers included "Helicopter Powerplant Installations," by R. A. Wolf, chief engineer, Helicopter Div., and C. P.

Spiesz, Bell Aircraft Corp., in which were treated the overall problems of powerplant installation and design as applied to present day helicopters, based primarily on experiences at Bell Aircraft Corp. In "Mechanical Instability of a Two-Blade Rotor on Anisotropic Supports," Robert Coleman and A. M. Feingold, Langley Memorial Laboratory, NACA, discussed helicopter vibrations while the rotor is turning and the aircraft is on the ground.

At the flight test session, C. E. Hastings, chief engineer, Hastings Instrument Co., described an electronic distance-measuring system in his paper, "Raydist—A Precision Radio Navigation and Tracking System." Raydist, he said, is a continuous-wave system based on the counting of interference patterns of electromagnetic radiations. He listed a few of the possibilities of future use as: applications to automatic control, blind landing, and airways control. Also presented at this session was the paper, "Progress in Dynamic Stability and Control Research," by W. F. Milliken, Jr., Cornell Aeronautical Laboratory, in which was given a resume of the research program in that field at the Cornell Laboratory. The general problem of flight testing of guided missiles, instrumentation requirements, and test program procedures were covered by H. K. Cheney, Consolidated-Vultee Aircraft Corp., in his paper "Flight Testing of Guided Missiles."

In technical sessions on Structures, R. M. Rosenberg, Aeronautics Instructor at Purdue, treated the subject "Critical Speeds of Shafts Under Torque." Mr. Rosenberg gave an exact analysis of the stress conditions, showing how the problem could be solved with differential equations and with Raleigh's principle of energy equilibrium. Other papers on structures included: a discussion of the dynamics of a swept wing; a general method for computing influence coefficients for aircraft structures with discontinuities and sweep-back; numerical methods for the calculation of elastic instability; a review of the column characteristics of sandwich panels having metal faces and honeycomb cores; and an analysis of the action of a column in the plastic range.

Scheduled for presentation at the aircraft design session were two papers on the XS-1 Bell transonic research airplane. However, at the last moment, this meeting was restricted for reasons of military secrecy. At this session, C. L. Johnson, Lockheed chief research engineer, described the design problems of the pioneer jet fighter, the P-80A.

Other papers on aerodynamics covered a wide range of subjects, some of which were: reduction of wind-tunnel turbulence with the use of damping screens; airfoil calculations from pressure distributions; subsonic and supersonic flow about slender bodies; aerodynamic performance of delta wings. At other sessions, discussions were held on meteorology, air transport, and aircraft fire protection and prevention.

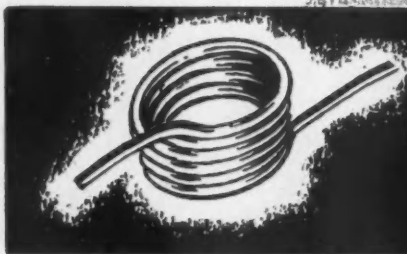
Fellowships and awards were presented by IAS as follows:

Honorary Fellowship—Frank W. Caldwell, Director of Research, United Aircraft Corp., and Sir Geoffrey DeHavilland, DeHavilland Aircraft Co., Ltd.

Fellowship—H. Roxbee Cox, Chairman and Managing Director, Power Jets Research and Development, Ltd.; J. Laurence Pritchard, Secretary, The Royal Aeronautical Society; William Goss Brown, Colonel, Office of Assistant Chief Air Staff (4), AAF Liaison With National Defense Research Commit-

(Turn to page 74, please)

ACCURATE'S Men and Machines are important to you...



...they are your assurance of getting the RIGHT spring for the job at lower ultimate cost!

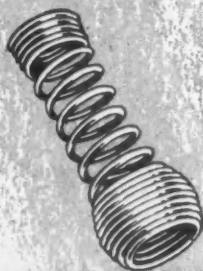


• Modern, precision spring making machines and experienced spring making personnel—this is the combination that guards the uniformly high quality of Accurate springs.

And Accurate goes beyond just making good springs. If you wish, Accurate engineers will sit down with you while your product is still on the drawing board and help you with your spring problems.

Whatever your spring requirements, get in touch with Accurate, today.

ACCURATE SPRING MFG. CO.
3810 W. Lake Street Chicago 24, Illinois

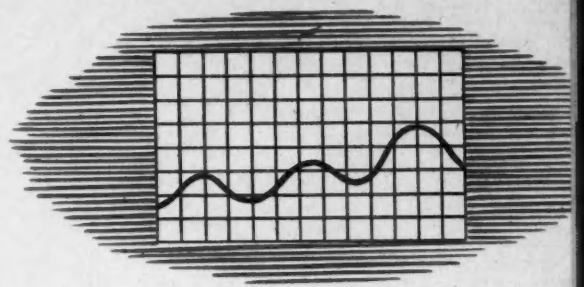


Accurate Springs

Be sure the springs you buy are Accurate!

Ask for your copy of the new Accurate Spring Handbook. It's full of helpful data on springs.





CLEARING PRECISION Whips this Severe Test

In the illustration at left is remarkable evidence of the precision built into every Clearing press. Although multiple dies are quite common in a single action press, it is unusual to see more than one draw die in a double action press. The Clearing double action, four point suspension press pictured here has three. At every stroke, this press performs simultaneously the first and second draws on a washing machine tub, and the second draw on the spinner.

To accomplish this, the blankholder or outer slide of the press is actually used in drawing the tub. The rigidity required for the accurate three-die draw is ensured by the Clearing one-piece welded frame, and by the long adjustable guide gibs which keep slides and bed constantly parallel.

Here's one more piece of evidence to prove what Clearing engineering competence has done, many times over, to meet unusual press demands. No matter how special your problem may be, Clearing engineers have the imagination and the technical knowledge to make your production dreams come true. As you plan tomorrow's operations, it will pay you to consult with Clearing.

SPECIFICATIONS

Capacity: Inner slide, 900 tons
Outer slide, 800 tons
Stroke: Inner slide, 42"
Outer slide, 31"
Strokes per Minute: 5
Bed Area: 106" x 102"
Die Cushion Equipment: 240 tons

CLEARING

THE WAY TO EFFICIENT MASS PRODUCTION

CLEARING MACHINE CORPORATION

6499 WEST 65TH STREET • CHICAGO 38, ILLINOIS

tee, Hdqrs., AAF; Emerson Wald Conlon, Head of the Department of Aeronautical Engineering, University of Mich.; S. Paul Johnston, Director, Institute of the Aeronautical Sciences, Inc.; Jerome Lederer, Chief Engineer, Aero Insurance Underwriters; Albert E. Lombard, Engineering Consultant, Consolidated Vultee Aircraft Corp.; Russell G. Robinson, Assistant Director of Aeronautical Research, National Advisory Committee for Aeronautics; Addison May Rothrock, Chief, Fuels and Lubricants Division, Cleveland Laboratory, National Advisory Committee for Aeronautics; Francis R. Shanley, Division Engineer, Engineering Research, Lockheed Aircraft Corp.; Abe Silverstein, Chief, Wind Tunnel and Flight Division, Compressibility Unit, Cleveland Laboratory, National Advisory Committee for Aeronautics; J. Parker Van Zandt, Aviation Director, The Brookings Institute.

The Sylvanus Albert Reed Award—to Robert T. Jones, Ames Aeronautical Laboratory, National Advisory Committee for Aeronautics, for his contributions to the understanding of flow phenomena around wings and bodies at speeds below and above the speed of sound.

The Thurman H. Bane Award—to Colonel Leighton I. Davis, Chief, Armament Laboratory, Engineering Division, Air Materiel Command, for Gyro Computing Sight for aiming guns, bombs, and rockets from fighter aircraft.

The Robert M. Losey Award—to Dr. Carl G. Rossby, Head, Department of Meteorology, University of Chicago, in recognition of outstanding contributions to the science of meteorology as applied to aeronautics.

The John Jeffries Award—to Brigadier General Malcolm C. Grow, Air Surgeon, AAF, for outstanding contributions to the

advancement of aeronautics through medical research.

The Octave Chanute Award—to Ernest A. Cutrell, Captain, American Airlines, Inc., for outstanding achievement in flight testing and developing instrument landing equipment and techniques contributing to improved performance of instrument flying.

The Lawrence Sperry Award—to Peter R. Murray for radio controlled systems for guided missiles and pilotless aircraft.

Bendix Brake Plant

(Continued from page 30)

tube and applies the bronze wire for brazing. Since the shell is fitted onto the fixture directly over the lower burners, the latter preheat the work. The upper burners drop onto the work automatically as the fixture passes the assembly station, melt the bronze wire as the table moves around to the last station. The cycle is so timed that brazing is fully completed when the work reaches the unloading station.

Following this operation the work is degreased, then plated to provide a corrosion resisting coating. As the last step, the shells are hung on an overhead monorail and transported to storage at the other end of the building near the assembly department.

The valve body, a small part requiring considerable machining, is a Zamac die casting produced on a Lester-Phoenix die casting machine in Plant 2. These castings are transported to the Hydro-Vac machine shop and go through the following operations:

OPERATION AND EQUIPMENT

First position—Load—4-spindle Model "H" National Acme-Gridley chucker.

Second position—Clean out flash from cored hole and chamfer.

Third position—Recess.

Fourth position—Finish valve seat and seal groove and finish face base.

Place in fixture, tap (2) $\frac{3}{8}$ pipe thread holes, from 1/32 radius at base and intersection of 2 5/16 diam—Rehnberg-Jacobson 2-unit tapping machine.

Burr—2 pipe tap holes, poppet seat and fins, blow off—Bench.

Wash—Detrex Vapor Degreaser.

Inspect.

The end plate described here is an aluminum casting made on the Lester-Phoenix machine. The sequence of metal cutting operations on this part is as follows:

OPERATION AND EQUIPMENT

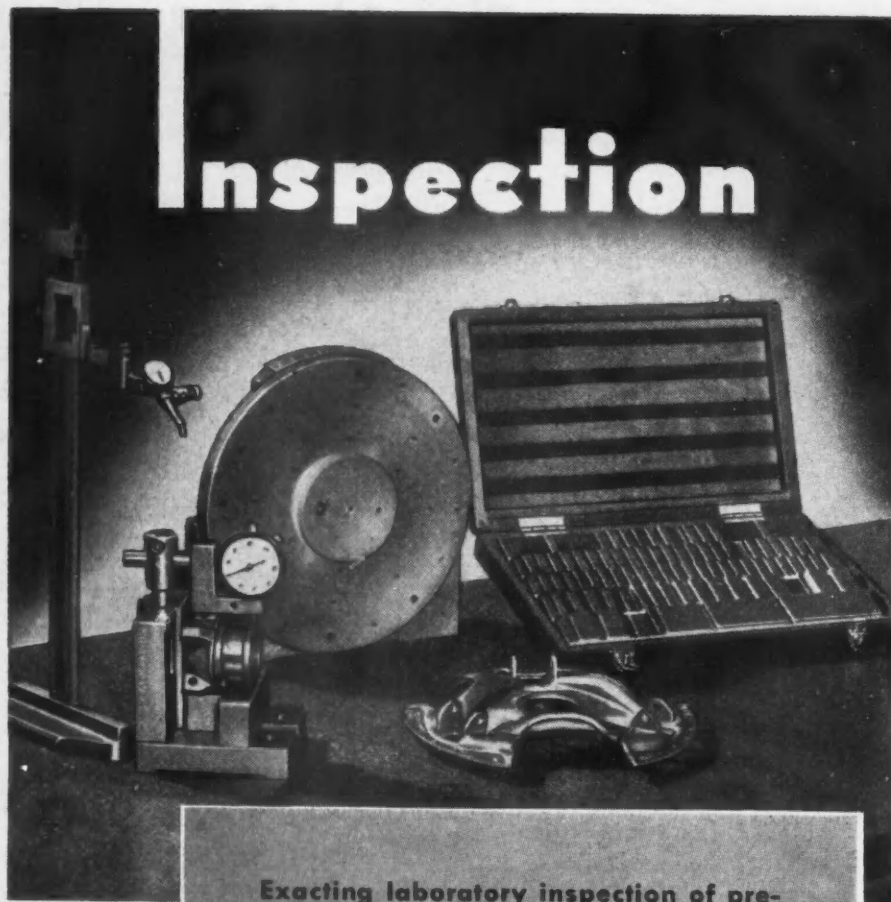
Remove flash from $\frac{1}{4}$ dia. cored hole—Bench.

First position—load and unload—8-in. RPA 6-spindle National Acme Gridley chucker.

Second position—Rough bore to 0.919-0.922 diam., Bore thread diam. to 1.305-1.312 and chamfer ID, Face end and rough form 6.748-6.750 diam.; Third position—Bore 0.6845-0.6875 diam. to size. Finish bore 1.056-1.062 diam.; Fourth position—Form recess; Fifth position—Ream 0.934-0.937 diam.; Sixth position—Tap 1 $\frac{1}{8}$ 18 thread and form groove; Ream to 0.690. Spotface 1 11/16 & 1 7/32 dia. holding 0.622-0.627—4-spindle drill press.

Station 1—Load and secure. Index; Drill (4) No. 29 holes $\frac{3}{8}$ deep; Drill (1) No. 29 hole through. Serrate and ream at $\frac{1}{2}$ -20 thread boss. Spotface and ream at $\frac{3}{8}$ NPT boss; Station 2. Ream 0.700 diam.; Station 3. Tap (4) 8-32 NC-2 holes $\frac{3}{8}$ deep; Tap (1) 8-32 NC-2 hole through; Secure part in fixture. Tap (2) 5/16-24 NF-2 holes. Tap

(Turn to page 76 please)



Exacting laboratory inspection of precision parts, in addition to regular spot and production line inspection of all parts, assures the Atwood Clutch customer of a precision product that consistently conforms to the original specifications.



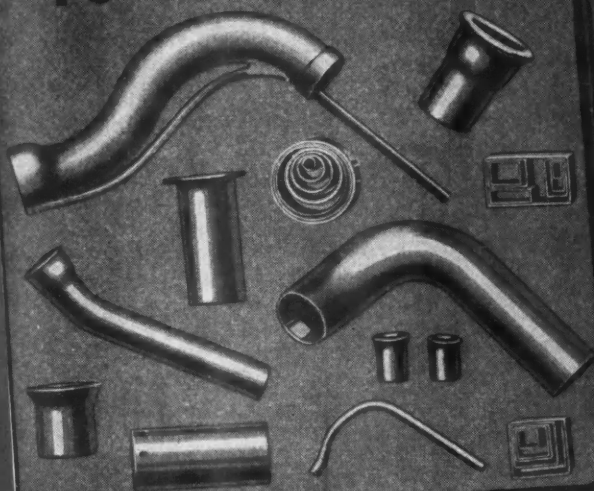
OVER A MILLION ATWOOD CLUTCHES IN SERVICE
THE ATWOOD CLUTCH COMPANY, AUBURN, INDIANA, U. S. A.

Formerly Atwood Manufacturing Company

MICHIGAN

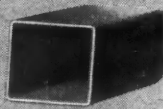
WELDED STEEL TUBING

Fabricated
PARTS
OF WELDED STEEL TUBING
TO YOUR DESIGN



**ROUND, SQUARE,
RECTANGULAR AND
SPECIAL SHAPES**

- IN COMMERCIAL LENGTH
- CUT TO SPECIAL LENGTHS



SQUARE
1/2" to 2 3/4"
14 to 20 gauge



ROUND
1/4" to 4" O. D.
9 to 22 gauge



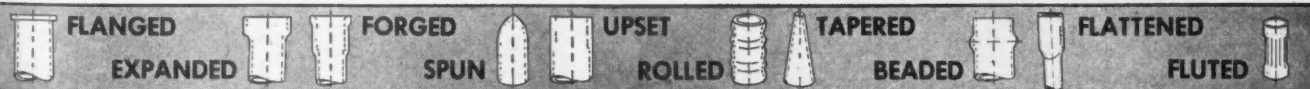
RECTANGULAR
1/2" to 2 3/4"
14 to 20 gauge

Adaptability!

Michigan Welded Steel Tubing is available in sizes and shapes that make it readily usable in the production of a wide variety of parts.

Whether you form and machine the parts in

your plant or order them prefabricated by Michigan, you will find this tubing exceptionally uniform in structure and adapted to reworking by any production process. Michigan welded tubing can be:



Engineering advice and technical help in the selection of tubing best suited to your needs. Address your inquiries to:

Michigan STEEL TUBE PRODUCTS CO.

More Than 25 Years in the Business

9450 BUFFALO STREET • DETROIT 12, MICHIGAN

FACTORIES: DETROIT, MICHIGAN • SHELBY, OHIO

DISTRIBUTORS: Steel Sales Corp., Detroit, Chicago, St. Louis, Milwaukee and Minneapolis—Miller Steel Co., Inc., Hillside, N. J.—C. L. Hyland, Dayton, Ohio—Dirks & Company, Portland, Oregon—James J. Shannon, Milton, Mass.—Service Steel Co., Los Angeles, Calif.—American Tubular & Steel Products Co., Pittsburgh, Pa.—Strong, Carlisle & Hammond Co., Cleveland, Ohio—C. A. Russell, Inc., Houston, Texas—Drummond, McCall & Co., Ltd., Toronto, Canada.

February 15, 1947

When writing to advertisers please mention AUTOMOTIVE and AVIATION INDUSTRIES

75

Thermalloy Pots

for
QUALITY-DEPENDABILITY-LONGEVITY
in HEAT TREATING SERVICE

HEAT AND
CORROSION
RESISTANT



For long useful service

M-26

Sound foundry practice, controlled chemical limits, and X-Ray control are greatly responsible for the successful performance of THERMALLOY annealing pots and covers.

There is a grade of THERMALLOY which will render maximum service life under every heat treating condition. THERMALLOY heat treating containers are available in a wide variety of sizes and patterns—large and small—round, square or oblong—shallow or deep.

Whether it be a MUFFLE, RETORT, BASKET, BOX or TRAY, you get more for your money when you buy THERMALLOY.

AMSCO ALLOY and THERMALLOY
are identical

AMERICAN
Brake Shoe
COMPANY

ELECTRO-ALLOYS DIVISION

ELYRIA, OHIO.

**X-RAY
CONTROLLED**

MUFFLES
RETORTS
BASKETS
CHAIN
BOXES
TRAYS
FURNACE
PARTS

(1) $\frac{1}{8}$ -24 NF-2 hole. Tap (1) $\frac{1}{8}$ -16 NF-2 hole. Tap (1) $\frac{1}{8}$ -20 NF-2 hole. Tap (1) $\frac{1}{8}$ NPT—Special Rehnberg-Jacobson tapping machine.

Wash—Detrex vapor degreaser.
Miscellaneous burring and filing—Bench. Inspect; Check 2 pieces at a time at 25 lb. pressure in water for leaks. Place in oven to remove water after water test—Water tank, Test fixture, Automatic stencil and Drying oven.

The reamer used in the routing above is tipped with cemented-carbide. As a matter of interest, Bendix has standardized on the use of pneumatic portable tools for many of the assembly operations in the brake department.

Stemming from years of experience, some exemplary safety measures have been developed for the monorail conveyor system so as to afford protection for both works and product. Each section of the monorail has a master control button which automatically stops the line in any emergency. Flat moving conveyors are protected with safety rails wherever practical. Guards are installed on every turn and on steep curves, and to catch material which may drop off a hanger. This offers positive protection to the workers below.

Glass Fabric Tires Produced Experimentally

Tires made from glass fabric are being produced experimentally at the Newark, O., plant of Pharis Tire and Rubber Co., according to a company report. Owens-Corning Fibre Glass engineers are cooperating in producing the tires which are constructed of special high strength glass cord fabric. Engineers say the two-ply tires are 40 per cent stronger than 4-ply rayon tires. The project, however, is still very much in the development stage and there is no indication that Pharis has any commercial plans for the tires at present.

Medium Price Car May Have Sealed Coolant System

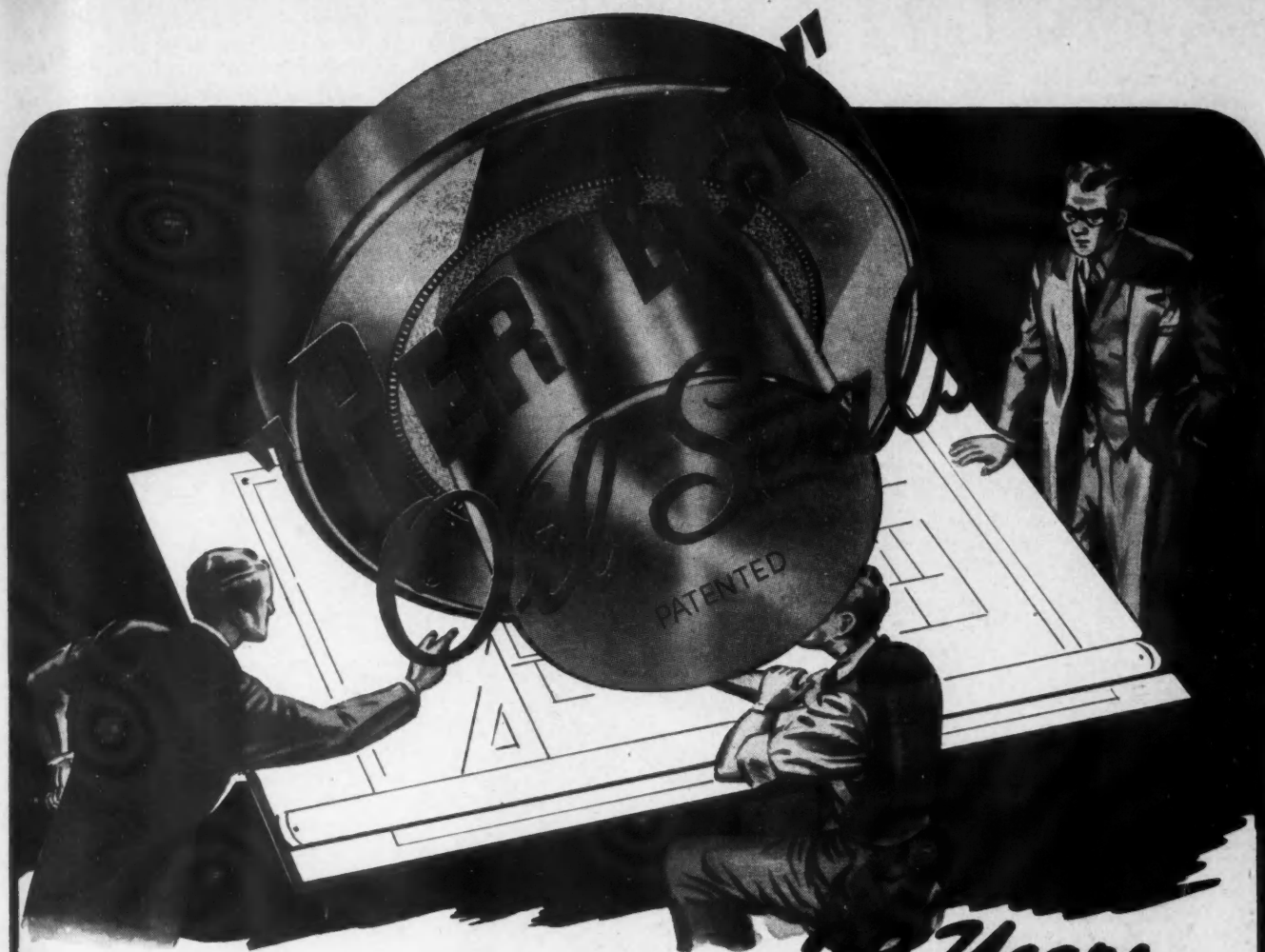
A report, entirely unconfirmed, circulating in Detroit at present is that one large automobile company has serious plans for a sealed coolant system. The report states that a car in the medium price class will have this system in the not too distant future.

It should be noted that Tucker Corp. also has announced that its car will include a sealed coolant system. However, the Detroit report is merely hearsay at present and may or may not mature.

Timken-Detroit Axle Co. Acquires Bossert Co.

All the assets and business, subject to the liabilities, of the Bossert Co., Inc., Utica, N. Y., were acquired by the Timken-Detroit Axle Co. in exchange for shares of Timken-Detroit Axle common stock, according to Walter F. Rockwell, president.

The Bossert Company has been a producer of metal stampings for over 36 years.



Could you afford to devote *20 Years* TO THE SOLUTION OF JUST ONE PHASE OF A MACHINE DESIGN PROBLEM?

Since the days of James Watt, machine designers have dealt with the problem of sealing shafts and mechanisms.

As design problems go, it doesn't appear to be too complicated, but its proper solution may determine to a great extent the effectiveness and service life of the mechanism.

For the past 20 years, Chicago Rawhide Engineers have concentrated on this problem. In all, more than 400 man years of effort have been devoted to its many phases, on the board and in the field. A lot has been learned in those years.

Why not take advantage of this vast accumulation of data and experience when designing your equipment and concentrate your own creative skill on other problems which have not been so satisfactorily solved.



CHICAGO RAWHIDE MANUFACTURING COMPANY

1310 ELSTON AVENUE • CHICAGO 22, ILLINOIS

PHILADELPHIA • CLEVELAND • NEW YORK • DETROIT • BOSTON • PITTSBURGH • CINCINNATI
67 YEARS MANUFACTURING QUALITY MECHANICAL LEATHER GOODS EXCLUSIVELY AND NOW SIRVENE SYNTHETIC PRODUCTS

February 15, 1947

When writing to advertisers please mention AUTOMOTIVE and AVIATION INDUSTRIES

77

News of the Industry

(Continued from page 52)

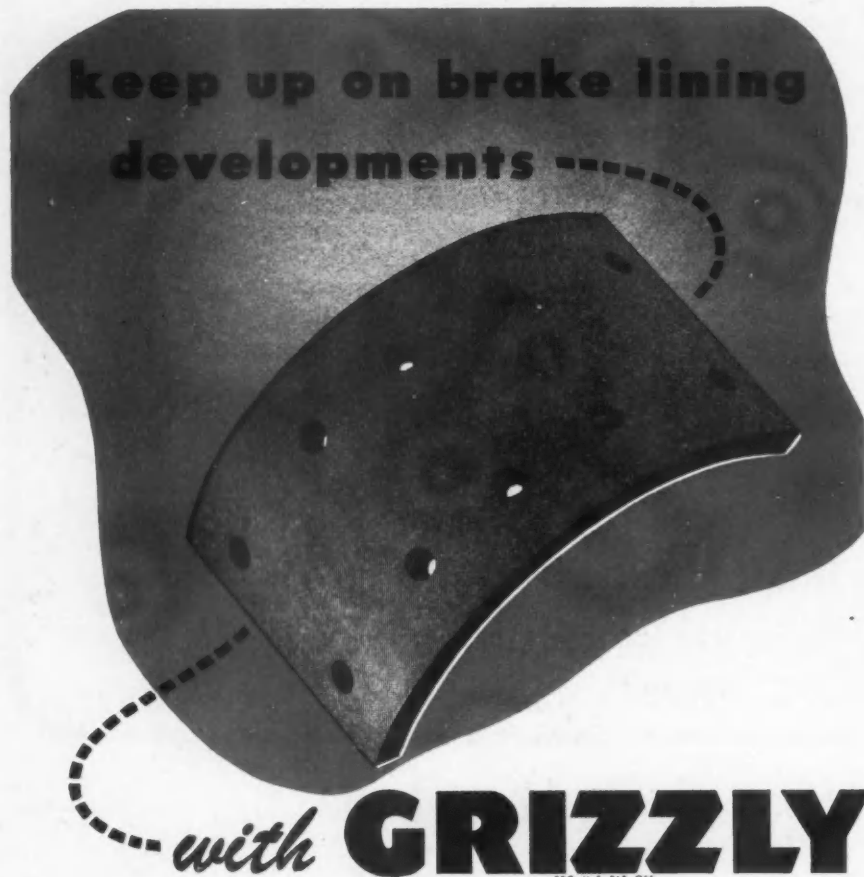
is that it will be used more for bargaining purposes than for any concrete belief that it will be achieved. It is part of the long range program of security benefits sought by the UAW-CIO. Bugas also held out some hope for better cooperation on the part of the union in the days ahead. He pointed out that after the insertion of a company security provision in the Ford contract, work stoppages fell from 131 in 1945 to 23 last year. Man hours lost through stop-

pages dropped from 767,000 in 1945 to 81,253 in 1946. Productivity is on the increase, he said, which is an encouraging statement in view of previous complaints that individual output was about 80 per cent of pre-war.

Vendors' Prices Still Increasing Month by Month

The industry generally does not look for an increase in automotive prices with the possible qualification that it may be necessary in the case of a substantial wage increase. However, there is some concern about the slow, but

persistent, upward creep in prices from vendors. The increase is particularly noticeable in steel products. One company head says that records kept by his purchasing department show that the trend has been upward month by month with no dips at any time. While profits at present volume are adequate to take care of some increases in material prices, it is obvious that unless the trend is reversed or prices are stabilized it may eventually become necessary to jack up car prices again. The general consensus, however, is that supply prices will be held in check and that a price increase will not be necessary.



Constant laboratory research backed up by 30 years experience in the manufacture of brake lining in both automotive and industrial fields keeps Grizzly constantly alert to developments resulting in finer brake lining. This same research and experience enables Grizzly to solve brake lining problems of widely divergent natures

—helps keep Grizzly in its enviable position of one of the largest, most dependable producers of molded brake lining.

When you are confronted with a brake lining problem, follow the example set by other production, engineering and purchasing men and bring your problem to Grizzly. Grizzly research and all-around manufacturing experience can be of importance to you.



GRIZZLY MANUFACTURING COMPANY
PAULDING, OHIO
PLANTS AT PAULDING AND BELL, CALIF.
Warehouse Stocks in Principal Cities

Cooperative Advertising Funds Building Up for Future Use

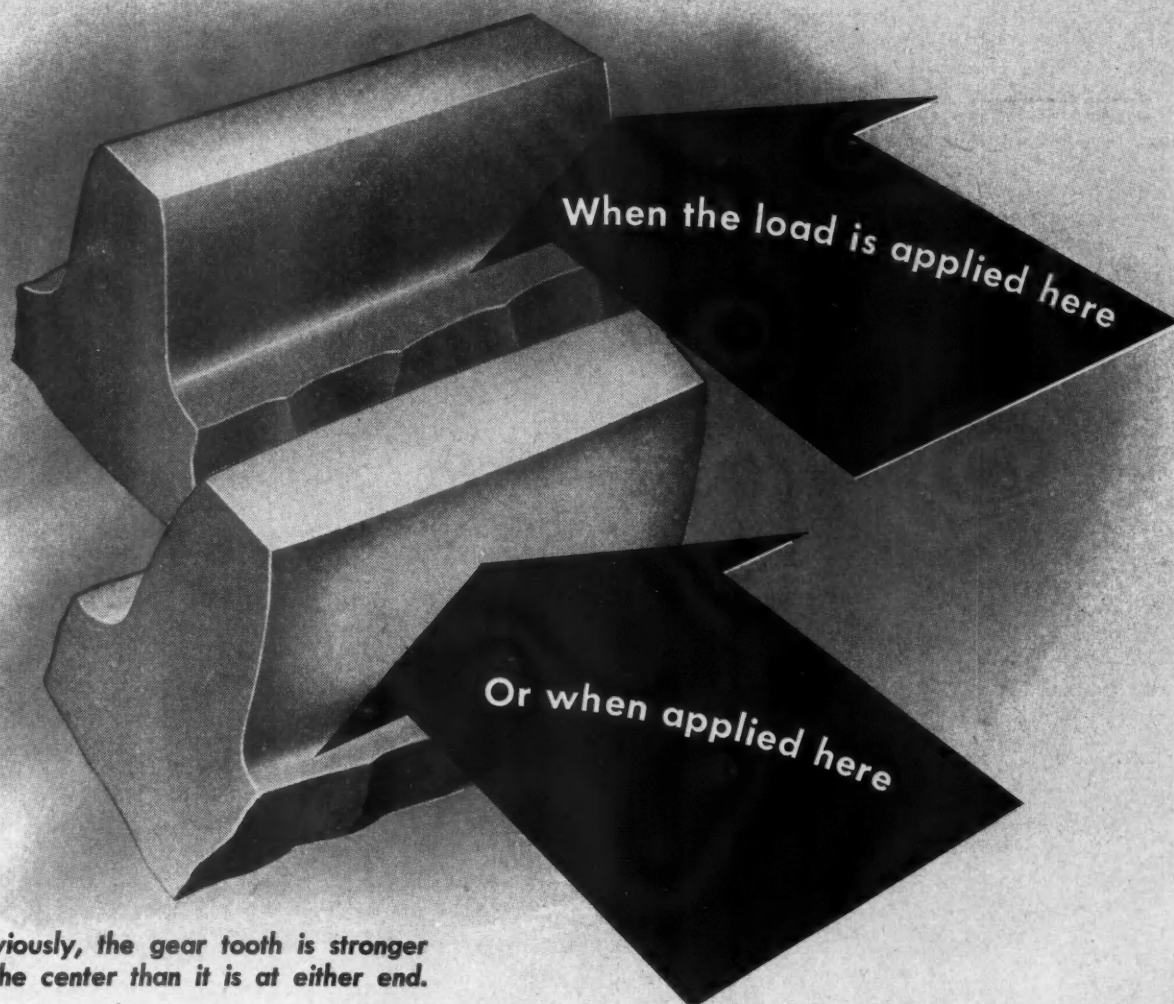
Although automobile dealers and manufacturers are not engaged presently in heavy consumer advertising, both are looking forward to the days when competition will call for extensive advertising outlays. Cooperative advertising funds are being stockpiled against the days when the buyers' market returns, when the accumulated advertising reserve will be put to good use. It is reported, for example, that the Dodge cooperative advertising fund now contains a reserve of around \$2 million and it is assumed that other companies also have sizable reserves put aside for the same purpose.

Harry Ferguson Acquires Plant at Euclid, Ohio

Speculation about where Harry Ferguson, Inc., will build its own tractor after the divorce from Ford next June 30 has been settled by the announcement that Ferguson has acquired a war plant at Euclid, Ohio, near Cleveland, formerly occupied by Cleveland Pneumatic Aerial Co. According to the announcement, initial production will be at the rate of between 300 and 400 tractors a day with eventual output reaching 1,000 daily. The 800,000 sq ft plant is said to have cost Ferguson \$1.9 million.

Ferguson has not revealed details about the tractor he intends to build, but one source close to the company says it will be very similar to the present model. He also stated that Ferguson has a very tight patent grip on the hydraulic controls of the system, which leaves the problem of duplication or development by Ford of a hydraulic lift mechanism that will do the job and yet not infringe on Ferguson's patent rights. Dearborn Motors Corp., Ford subsidiary, which will handle the distribution of the Ford tractor, is non-committal about its plans in that respect. However, it is noted that Ferguson is bearing down heavily on the patented features of his control system and advertising of the organization now carries no mention of the Ford name.

WHERE IS A CRITICALLY LOADED GEAR TOOTH MOST APT TO BREAK?



Obviously, the gear tooth is stronger at the center than it is at either end.

Therefore, only when loads are confined to the central tooth section and avoided at the tooth ends is maximum tooth strength developed.

That is precisely what is accomplished when gear teeth are given the Elliptoid form. The amount of crown need be very little. From .0003" to .0005" per inch of tooth face is sufficient to centralize the loads and protect the gear.

Elliptoid teeth are produced on Red Ring Gear Shaving Machines for both spur and helical gears-up to 36" pitch dia.

Ask Red Ring Engineers for performance data on gears of this type.

2524

**RED RING
PRODUCTS**

NATIONAL BROACH AND MACHINE CO.

5600 ST. JEAN • DETROIT 13, MICHIGAN

SPECIALISTS ON SPUR AND HELICAL INVOLUTE GEAR PRACTICE • ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORMS

February 15, 1947

When writing to advertisers please mention AUTOMOTIVE and AVIATION INDUSTRIES

79

More Car and Truck Plants on the Pacific Coast

(Continued from page 19)

The plant facilities will consist of a two-story office building 300 ft across the front and 50 ft deep connected to an assembly plant 710 ft wide and 850 ft deep. One side of the assembly building will house the activities of the Fisher Body Division, which will supply bodies to the Chevrolet assembly line located on the other side. The new plant is being designed to produce 400 cars and trucks per day on an eight-

hour shift.

Incorporated in the design of the buildings is a type of "sunshade" construction which has been much used in Brazil for several years, but which has thus far not been used in the Los Angeles area. It consists of deeply set windows on the sides exposed to the sun, and the construction of fixed panels outside the windows, so located that they ward off the direct rays of

the sun without shutting off the light. Thus, the sun does not transmit heat to the interior of the building, but does supply ample light and cooler working conditions.

Chevrolet's decision to establish a new plant in the Los Angeles area is the result of a survey of the West Coast which indicated the advisability of increasing the supply of new cars and trucks.

New Lincoln-Mercury Plant

Upon completion of a new Lincoln-Mercury assembly plant, now under construction in Los Angeles, Ford Motor Co. will have three units on the Pacific Coast—Richmond, Los Angeles, and Long Beach, Calif. Ford expects to be producing Lincoln and Mercury models in Los Angeles by September 1947. Peak production at the new plant is expected to be 250 units daily, with employment of 1500 workers.

Ford cars and trucks are assembled at Long Beach, and Ford cars and trucks and Mercurys are being turned out at the Richmond plant. Models now in production are Tudors, Fordors, Club Coupes, convertibles and station wagons in both Ford and Mercury lines. On completion of the new 426,000 sq ft Los Angeles plant, Mercury production will be discontinued at Richmond and transferred to the new plant. The business coupe has been eliminated and the Sportsman model is not being made at this time.

Production at the Richmond plant in 1941 reached 34,383 passenger cars and 11,461 trucks. The number of people employed that year was 1627. For 1946, this plant produced 25,838 cars and 8612 trucks, with 1655 workers on the payroll. The Richmond unit has 575,954 sq ft of space.

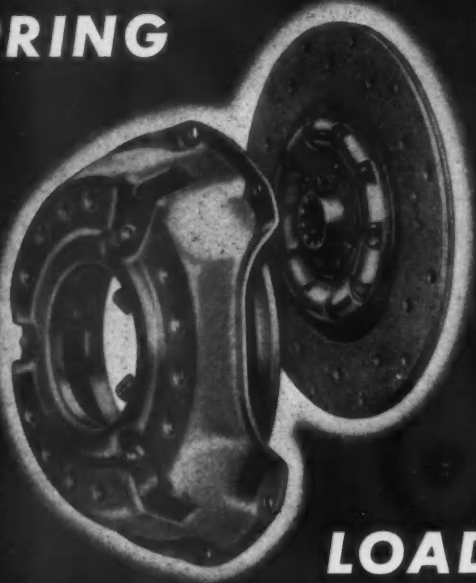
At the Long Beach plant, 21,618 cars and 6735 trucks were assembled in 1941. The plant employed 833 people that year. Figures for 1946 show 18,647 cars and 6051 trucks assembled; 1054 workers were employed at Long Beach last year. A new bonderizing unit soon is to be installed in the Long Beach plant. New assembly equipment in the 451,561 sq ft plant are being held for the 1948 models.

The majority of the parts used by Ford's Pacific Coast plants are shipped from the Rouge Plant in Dearborn, and from other suppliers in the neighborhood of Detroit. However, they do get some material and subassemblies from Pacific Coast suppliers.

Ford Increases Buying

A further expansion of the Ford Motor Company's decentralized buying program, with emphasis on the Pacific Coast, began this month in Los Angeles and San Francisco where buyers' exhibits were held under the direction of Albert J. Browning, Ford vice-president and director of purchases, who announced that the Ford company hopes to secure Pacific Coast suppliers (Turn to page 82, please)

ROCKFORD SPRING



LOADED CLUTCHES

LIGHT PEDAL PRESSURE

CUSHIONED ENGAGEMENT

VIBRATION DAMPENING

ACCURATE BALANCE

DIRT EXCLUSION

HEAT DISSIPATION

LIFETIME ADJUSTMENT

* Vibration dampeners in ROCKFORD Spring-Loaded CLUTCHES blot out most of the torsional vibration in car, truck and tractor power transmission lines. The dampener springs are completely housed. Sturdy lugs protect against damage by shock loads and overloading. An adjustable friction snubber controls recoil and provides cushioning action.

Send for This Handy Bulletin

Shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications.



ROCKFORD CLUTCH DIVISION

BORG-WARNER

315 Catherine Street, Rockford, Illinois, U.S.A.

★ SUPERB ★

OIL RESISTANCE

is only one of Hycar synthetic rubber's unusual and valuable properties. Others are listed in the box at the right.

But most important, these properties may be had in an almost limitless number of combinations, each designed to meet specific service conditions of the finished Hycar part.

Our files contain more than 5000 recipes for Hycar compounds—each compound engineered to do a certain job. Parts made from HY-

CAR have seen service in *every* industry, giving long life, dependability, and economical operation.

That's why we say, ask your supplier for parts made from Hycar. Test them in your own application, difficult or routine. You'll learn for yourself that it's wise to use HY-CAR for long-time, dependable performance. For more information, please write Department HD-2, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio.

Hycar

Reg. U.S. Pat. Off.

LARGEST PRIVATELY PRODUCED BUTADIENE TYPE

American Rubber

B. F. Goodrich Chemical Company

A DIVISION OF
THE B. F. GOODRICH COMPANY

CHECK THESE SUPERIOR FEATURES OF HYCAR

1. EXTREME OIL RESISTANCE — Insuring dimensional stability of parts.
2. HIGH TEMPERATURE RESISTANCE—up to 250° F. dry heat; up to 300° F. hot oil.
3. ABRASION RESISTANCE—50% greater than natural rubber.
4. MINIMUM COLD FLOW—even at elevated temperatures.
5. LOW TEMPERATURE FLEXIBILITY—down to -65° F.
6. LIGHT WEIGHT—15% to 25% lighter than many other synthetic rubbers.
7. AGE RESISTANCE—exceptionally resistant to checking or cracking from oxidation.
8. HARDNESS RANGE—compounds can be varied from extremely soft to bone hard.
9. NON-ADHERENT TO METAL—compounds will not adhere to metals even after prolonged contact under pressure. (Metal adhesions can be readily obtained when desired.)

for a potential of more than 50 million dollars a year. Annual purchases of the Ford company amount to about 650 million dollars.

Samples and blueprints of 2600 items were displayed at the Pacific Coast exhibits, suppliers being sought particularly for frames, machined forgings, machined castings, stampings, screw machine products, and assemblies. Items now purchased from Pacific Coast suppliers by the company's home office include bumpers, chassis springs, cushion springs, batteries, paint, upholstery, wheels, gasoline tanks, tires and other rubber parts, amounting to more than 15 million dollars annually.

In launching the new expansion program, Mr. Browning stated: "The Ford Motor Co. and its officials have great faith in the future of the Pacific Coast and we are anxious to participate—even assume a degree of leadership—in the expansion of the industry there."

Studebaker Production

Automotive production has now replaced wartime aircraft work at Studebaker Pacific Corporation's Vernon plant in the Los Angeles area. At present, the plant is producing model 6G Champions, and assembly of 14A Commander passenger cars is to start in

the immediate future. Production in the 320,000 sq ft plant reached 12,974 cars in 1941; 362 factory workers were employed. Today, 450 factory production workers are assembling cars. The proposed production figure as of January, 1947, projected to an annual basis, is 15,250 units. However, it is hoped that the production goal of 20,000 can be reached for the fiscal year beginning March 1, 1947, according to Stanley Whitworth, vice-president, Studebaker Pacific Corp. Approximately 700 employees are expected to be on the payroll March 1.

Subassemblies and parts for Studebaker Pacific assembly production are obtained largely from the parent corporation's plants or by direct shipment from Eastern parts suppliers. However, batteries, tires, seat cushion and seat back springs, all interior trim, enamel, greases, lubricants, chassis springs, standard connecting parts, and factory supplies are purchased on the Pacific Coast whenever obtainable. The company's general policy is to obtain as much material as possible from the West, taking into consideration competitive prices and costs of any special tooling.

New operations consist of frame drilling for body bolts, radiator and front suspension attachments. New sheet metal enamel spray booth systems for body and other sheet metal parts, with improved controlled purified and humidified air, have also been installed. Humidified air is now being used in paint ovens for obtaining increased luster. Studebaker plans, as soon as equipment can be obtained, to fabricate from rough stampings all sheet metal assemblies such as bodies, hoods, and fenders. All such assemblies will be Bonderized and primed for final color coat.

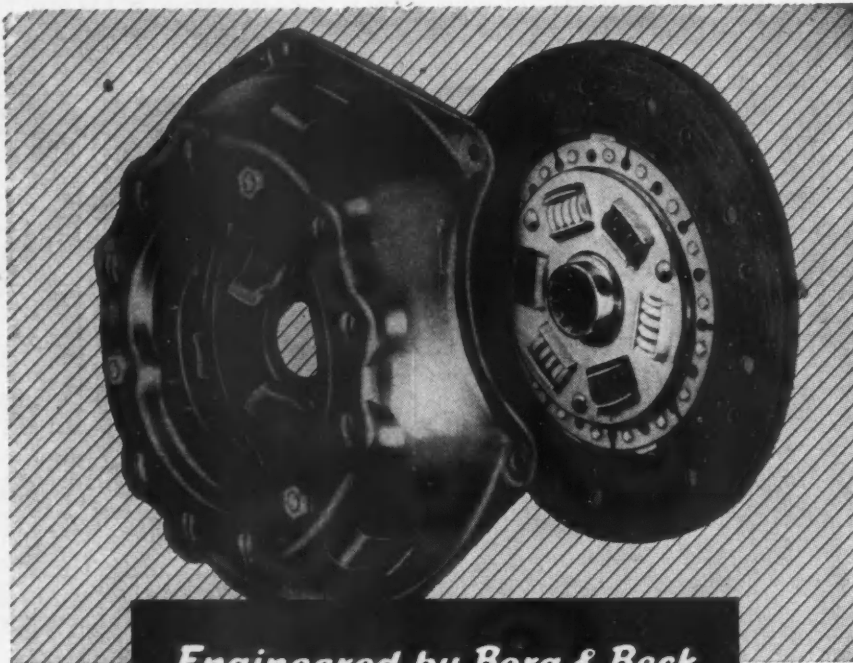
First Dodge Cars

In 1932, Chrysler Motors of California built its Los Angeles assembly plant for production of Plymouths and Dodge trucks. The first Dodge passenger car ever assembled on the Pacific Coast rolled off the assembly line last September. Latest annual prewar production figures showed 42,000 Plymouths made at the 460,000 sq ft Los Angeles plant. Chrysler officials are not ready at this time to issue any further information about the company's Pacific Coast activities.

Kaiser-Frazer Plans

Kaiser-Frazer Corporation is occupying a portion of the former Douglas Aircraft plant at Long Beach, 20 miles from Los Angeles. The \$4,500,000 automobile assembly unit consists of two former aircraft production buildings with a total of 540,000 sq ft, plus a portion of an adjacent office building.

Reconversion for the Kaiser-Frazer operation has entailed construction of 15,000 ft of railroad track from a Union Pacific spur near the plant; installation of 12,110 ft of conveyor system. (Turn to page 84, please)



Engineered by Borg & Beck
means... FINER BALANCE
SMOOTHER PERFORMANCE

You can depend on—

BORG & BECK

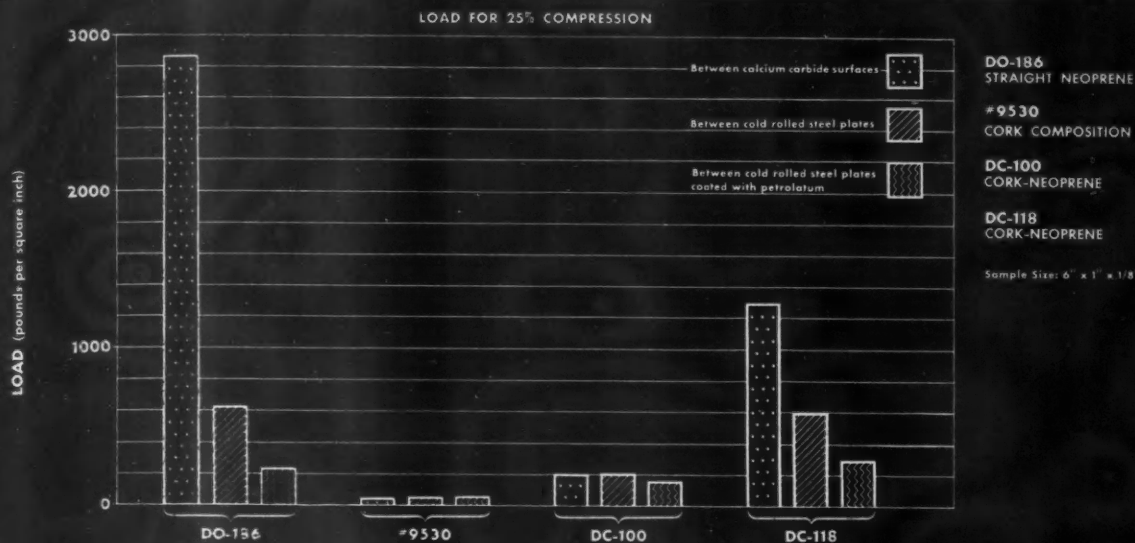
FOR THAT VITAL SPOT WHERE POWER TAKES HOLD OF THE LOAD !

BORG & BECK DIVISION

BORG-WARNER CORPORATION

CHICAGO, ILLINOIS





EFFECT OF SURFACE CONDITION ON GASKETS

Greasy, oily, or smooth surfaces may upset load calculations

Common manufacturing processes often deposit grease or oil on surfaces that are to be sealed. Some processes leave surfaces smoothly finished. With such conditions certain type gaskets may skid and leak.

Non-compressible rubber materials slip badly on greasy or smooth surfaces. Thus grease, cutting oils, or a wet sticker can upset load calculations based on dry rubber placed between clean, non-skid plates. On the other hand, truly compressible materials are relatively unaffected by slick surface conditions.

The chart given above shows the comparative behavior of four different resilient materials when each is subjected to three differing surface conditions.

The first of these materials, Armstrong's DO-186, is a straight Neoprene compound. It requires a load of over 2800 pounds for 25% compression when gripped between silicon carbide surfaces. Between cold rolled steel plates coated with petrolatum, load for the same deflection drops below 250 pounds. Even without a lubricant, skid on smooth steel surfaces reduces the load required to about 600 pounds.

With cork composition, a truly compressible material, varying surface conditions have little effect. As shown in the chart, our #9530 Cork Composition compresses 25% with virtually the same load on a greasy surface as on dry silicon carbide. Maximum load variation is only about 3 pounds.

By combining cork and rubber in varying amounts, compositions can be made whose behavior on slick surfaces falls between that of cork and straight rubber. For example, Armstrong's DC-100 is a Neoprene composition with a high cork content. As shown in the chart, load on a greasy surface (160 pounds) is only slightly less than on silicon carbide (200 pounds). On plain rolled steel plates, no slippage at all is evident.

The fourth material charted, our DC-118, is more rubber-like in its behavior because it contains relatively little cork. Here load drops from about 1300 pounds on silicon carbide to 600 pounds for smooth steel plates. The same plates coated with petrolatum further reduce load to about 300 pounds. In each case, deflection is 25%. Other Armstrong's cork-and-rubber compositions provide intermediate degrees of compressibility.

* * *

Since many variables influence the choice of a gasket material, we recommend that you discuss your specific application with an Armstrong representative before you set up your specification. He will be glad to suggest suitable materials and supply you with various samples for testing.

If you prefer, send drawings and details to us. You will find our recommendations unbiased and keyed to good current gasketing practice.



SEND FOR FREE BOOKLET.

For specification and application data on Armstrong's more than 50 resilient sealing materials, send for a free copy of the latest

edition of "Gaskets, Packings, and Seals," twelve pages of helpful information. Address Armstrong Cork Company, Gaskets and Packings Department, 1502 Arch Street, Lancaster, Pennsylvania.

ARMSTRONG'S GASKETS · SEALS · PACKINGS



Cork Compositions • Cork-and-Synthetic-Rubber Compositions
Synthetic Rubber Compounds • Cork-and-Rubber Compositions
Fiber Sheet Packings • Rag Felt Papers • Natural Cork

tem, consisting of 9380 ft of floor conveyor and 2730 ft of overhead conveyor; construction of baking ovens, paint booths, Bonderite units, paint mixing and circulating systems; unloading platforms; and other assembly installations.

Production will begin as soon as sufficient material is available to maintain Willow Run at its present assembly rate and provide a surplus for the Long Beach plant. When placed in operation, Long Beach will have a capacity of 400 cars per day on a one-shift basis. Employment at peak production is estimated to reach 3500.

Kaiser-Frazer anticipates that 50 per

cent of its parts and accessories will be provided by Pacific Coast manufacturers, although body stampings, motors, and other parts will be shipped from the Willow Run plant. Henry J. Kaiser, Jr., is in charge of the Long Beach unit.

Willys to Start Soon

At the Willys-Overland Maywood plant, in the Los Angeles area, assembly activities are expected to begin by mid-1947. A new six-cylinder passenger car will make its debut this year (see Oct. 15, 1946, page 32, AUTOMOTIVE AND AVIATION INDUSTRIES). Station wagons, passenger cars, trucks and Universal Jeep models will be as-

sembled on a one-shift basis geared at 100 units a day. Employment is expected to start at about 700, with additional shifts and workers added as needed. Prewar production at the 375,000 sq ft plant was 11,000 units annually with employment of 450. A large percentage of parts and materials will be purchased in Southern California in order to reduce freight costs, according to company officials.

Darrin Motors of California will manufacture the "Darrin" beginning April, according to E. M. Reaume, Chief Engineer (see AUTOMOTIVE AND AVIATION INDUSTRIES, Aug. 1, 1946, The Darrin Car, for a complete description). Present plans call for an all-aluminum body. The new Anderson forming-by-drawing process will be used in fabrication of body panels. Windshield frame, cowl, and door lock pillars will be aluminum castings. Early production plans call for 25 cars a month. The company expects to step up its production to 100 units a month by the end of 1947. Except for its Continental engine the car will be completely manufactured in Los Angeles.

Packard Motor Car Co. indicated its interest in this area when its President and General Manager, George T. Christopher, said recently in Los Angeles, "When our company can deliver 40,000 cars annually west of Denver, there will be one of our assembly plants in the general vicinity of Los Angeles. Surveys have indicated to us that about 50 per cent of the West Coast's potential business is close to this city."

Parts Made on Pacific Coast

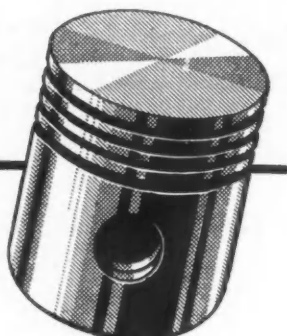
In addition to the extensive car and truck assembly operations, there is a substantial parts manufacturing business in California with indications that it will become increasingly larger. Prior to World War II about 11 per cent of all parts used in Pacific Coast automobile assemblies were manufactured in the area. Determined efforts to use locally manufactured parts and accessories are apparent. Recently, Kaiser-Frazer displayed 1250 of its automobile parts on tables and invited local manufacturers to see whether they could produce them at competitive prices.

A sizable parts manufacturing industry is already well established. Battery manufacturers in the San Francisco Bay area include Auto-Lite, Hobbs, and Pico, while Willard and Exide have plants in Los Angeles. Automobile upholstery is made by National Automotive Fibres in Oakland. National Motor Bearing Co. is at Redwood City and L. A. Young Spring and Wire Co. has plants in both San Francisco and Los Angeles. In Oakland, there is the Laher Spring & Tire Co. U. S. Spring and Bumper Company, Los Angeles, employs over a thousand people and has a capacity of 5000 bumpers and 5000 springs a day. For the first time in California, automobile wheels will be produced. Norris Stamping & Manufacturing Co., Los Angeles, (Turn to page 86, please)

8 out of 13*

Leading makers of pistons
use

OAKITE CLEANING MATERIALS



*rated AAAA in Thomas' Register

FIGURES don't lie. The overwhelming 8-out-of-13 preference shows that Oakite materials give more effective cleaning results. And that means *lower per unit costs*.

Reason enough why 8 out of 13 leading makers of pistons demand Oakite compounds for such cleaning jobs as removing oil, grease and other foreign matter from pistons before and after grinding . . . to clean sensitive aluminum and aluminum alloy parts with kind-to-surfaces Oakite compounds. Those manufacturers know that Oakite materials give the exact degree of cleanliness so essential to the profitable production of precision-built pistons and other vital automotive parts.

How YOU Can Profit

No matter what product you make, it'll pay you to specify Oakite compounds for your surface conditioning, derusting, degreasing and other operations requiring the chemistry of surface cleaning. For advisory help *plus* technical data on any phase of cleaning, write to Oakite Products, Inc., 28A Thames Street, New York 6, N. Y.

OAKITE

REG. U. S. PAT. OFF.

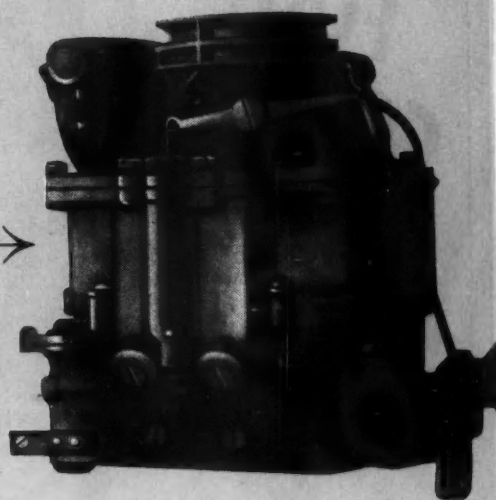
SPECIALIZED CLEANING MATERIALS • METHODS • SERVICE

Technical Representatives in Principal Cities of U. S. & Canada

wherever gasoline goes

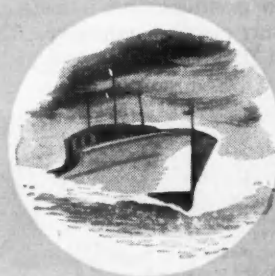


STROMBERG



STANDS OUT

for reliable carburetion



ECLIPSE MACHINE DIVISION

of Bendix Aviation Corporation

ELMIRA • NEW YORK



*REG. U. S. PAT. OFF.

West Coast Tire Production

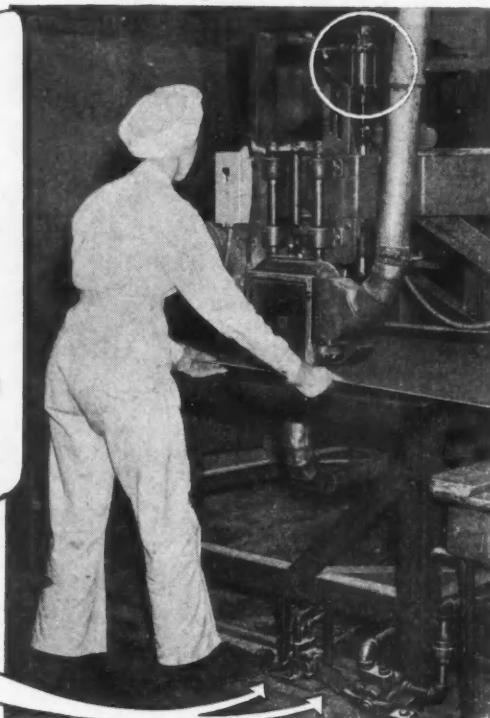
	1946	1947
Total employees	17,000	17,000
Total value tire and tube output	\$110,000,000	\$130,000,000
Total tire production	9,600,000	13,200,000
Total tube production	7,200,000	10,800,000

has recently contracted to make them for Ford. Ensign Carburetor Co. has a plant at Huntington Park. The growing plastics industry is making moldings and other parts.

Ohio Rubber Co., at Long Beach, produces molded mechanical rubber items such as motor mounts, bumper pieces, and floor mats. About 40 other rubber manufacturers in the Los Angeles area are either already producing some item for the automobile industry, or are turning their eyes toward that market.

Los Angeles County ranks second to Akron in the United States in the manufacture of automobile tires and tubes, with Firestone, Goodrich, Goodyear, and United States Rubber located there. Estimates of automobile tire and tube production by these four major companies is shown in the accompanying table.

FOOT-CONTROL
Speeds
DEFECT-CUTTING
in Veneer Plant



Cutting out surface defects in veneer panels is simplified and accelerated by the use of NOPAK equipment at Pacific Veneer Co., New Westminster, B.C. Here a NOPAK Model E Air Cylinder actuates vertical movement of the veneer cutter. The cylinder is controlled by a NOPAK Model R Foot Valve, leaving the operator's hands free to position the panels quickly and accurately . . . greatly increasing cutting capacity. The other foot valve shown is a NOPAK Model RN, with neutral holding position, which controls a cylinder on an adjacent machine.

GALLAND-HENNING MFG. CO., 2774 S. 31st ST., Milwaukee 7, Wis.

NOPAK
VALVES AND CYLINDERS
DESIGNED for AIR and HYDRAULIC SERVICE

A 5148-1P

Production Men . . .
This application of NOPAK Valves and Cylinders may suggest how the operating cycles of certain machines in your plant can be speeded up and manual effort decreased.

BOOKS . . .

GAS TURBINES AND JET PROPULSION FOR AIRCRAFT (Fourth Edition), by G. Geoffrey Smith, M.B.E., published by Aircraft Books, Inc., 370 Lexington Ave., New York, N. Y. This new edition by the editorial director of *Flight* and *Aircraft Production*, London, has been enlarged to 246 pages. Illustrations and graphs have been increased to 200 and the volume has been extended to 21 chapters.

The book contains an exhaustive study of gas turbines as applied to aircraft, including possible application of the new power unit to ships, railroads and automobiles. It deals extensively with the fundamental principles, construction, operating, testing and maintenance of the engines.

A complete analysis is made of all known jet-propelled planes and engines in operation or projected in the United States and Britain. German jet fighters and bombers are also described in detail. All are illustrated by photographs and drawings.

The British authority gives detailed specifications, performance, characteristics and other data where available. He shows how speed, operating height, rate of climb, carrying capacity and range have improved beyond recognition in recent years.

The book contains the first complete review of American, British and German gas turbines, with illustrations and detailed drawings. Among the British turbines discussed are: Armstrong-Siddeley—A.S.X. and Python; Bristol—Theseus 1; De Havilland—Goblin 11 and Ghost 11; Metropolitan-Vickers—F-2, Series IV, F-2/3; Rolls-Royce—Derwent V, Nene 1, Trent and Clyde. American turbines include: The General Electric 1-40, the TG-100 and the J-35; the Westinghouse 9.5B (Baby) and the 19-B (Yankee). The author notes that the Wright Aeronautical Corporation has also embarked on a gas turbine program, specializing in high-power units. In the chapter devoted to German turbines, details or units produced and projected by Daimler-Benz, Heinkel-Hirth and Junkers are examined.

Other aspects of the new aviation developments, included for the first time in the new volume include: Metallurgy . . . problems associated with turbine disc and blades, Testing and Maintenance, Combustion Systems . . . fuel equipment and control, Gas Turbine Components . . . radial and axial compressors and Thrust and Performance.

The author devotes considerable attention to aerodynamic problems . . . boundary layer control and compressibility effects, which immediately enter the spotlight in any discussion of high-altitude, high-speed aircraft. He believes that with the development of turbines of low fuel consumption, it is likely that we shall see boundary layer control in normal employment.

He also reviews the application of jet propulsion to guided missiles and bombs. Included are his own plans for a long range bomb which he submitted to the Department of Scientific Research in October 1943. He furnishes detailed drawings and specifications for both the German V-1 and V-2 flying bombs.

Sheffield Expands

According to an announcement by executives of the Sheffield Corp., a company has been formed in Australia for the production and sale of Sheffield gages, precision measuring instruments, machine tools and contract engineering and manufacturing services. It is incorporated as the Sheffield Corp. of Australia Pty. Ltd.

Compressing Maintenance Problems



**JOB
PROVED**

SUN COMPRESSOR LUBRICANT...

Keeps Compressors Operating Four Years on 24-Hour-a-Day Schedule

Twenty thousand and ten hours of trouble-free operation were piled up by one unit in a big, industrial plant operating a battery of heavy-duty 400 horsepower compressors. There was no time out except for routine inspections. Sun Oil was used from the very first hour these compressors were installed. When they were finally shut down for major overhauls, no wear was apparent and no major parts had to be replaced.

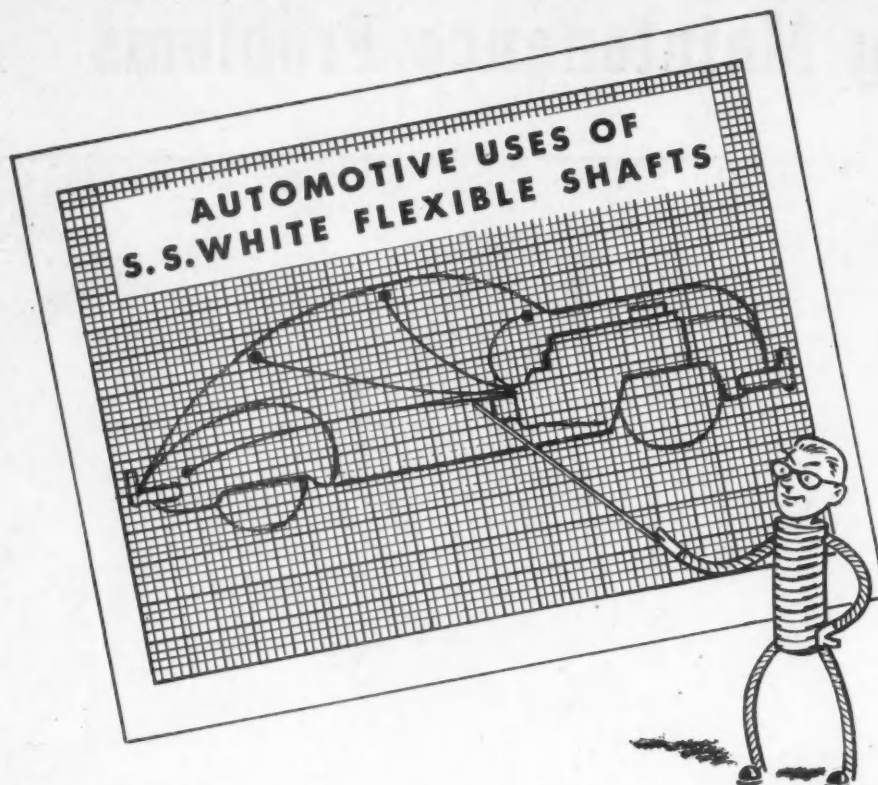
Sun "Job Proved" industrial lubricants are making similar impressive records in all kinds of industrial plants, keeping production on an even, round-the-clock basis, holding down maintenance and operating costs. If you have problems concerning the lubrication of compressors, power plants, machine tools or other industrial equipment — remember the Sun Engineer is at your service without obligation on your part. Just phone the nearest Sun office or write Dept. (AA-2) . . .

SUN OIL COMPANY • Philadelphia 3, Pa.

Sponsors of the Sunoco News-Voice of the Air — Lowell Thomas

SUN
**SUNOCO**

**INDUSTRIAL
PRODUCTS**



AN EASY WAY TO BRING ROTARY POWER TO ANY POINT IN A MOTOR VEHICLE

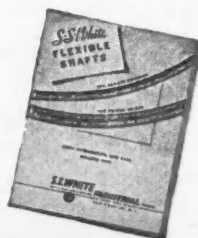
With an S.S. White power drive flexible shaft take-off from the transmission, rotary power can be delivered to any point in an automobile, bus, truck or other motor vehicle for operating accessories. The take-off is easy to make and the flexible shaft can be readily installed where it will be out of the way all the way.

Combinations of flexible shaft, casing and end fittings can be supplied in a wide range of capacities and in practically any length—ready for easy connection at both ends.

Remote control of radios or other accessories can also be provided from any point to any other point in a vehicle. Combinations for such applications are made up with remote control type shafts specially designed for smooth, sensitive control.

GET DETAILS IN BULLETIN 4501

Write for a copy today.



S.S. WHITE INDUSTRIAL
THE S. S. WHITE DENTAL MFG. CO. DIVISION
DEPT. A, 10 EAST 40TH ST., NEW YORK 16, N. Y.



FLEXIBLE SHAFTS • FLEXIBLE SHAFT TOOLS • AIRCRAFT ACCESSORIES
SMALL CUTTING AND GRINDING TOOLS • SPECIAL FORMULA RUBBERS
MOLDED RESISTORS • PLASTIC SPECIALTIES • CONTRACT PLASTICS MOLDING

One of America's AAAA Industrial Enterprises

PACIFIC COAST REPRESENTATIVE — F. W. STEWART MFG. CORP.
431 VENICE BLDG., LOS ANGELES 15, CALIF.

New Products for Aircraft

(Continued from page 47)

any other operational data which can be measured with standard aircraft instruments, plus two "off-on" functions. It is designed to meet the proposed CAB requirements for commercial airlines, providing data which can be used by the CAB for accident analysis. In addition, it can be used by airlines for operational analysis, to determine whether the flight was made as planned.

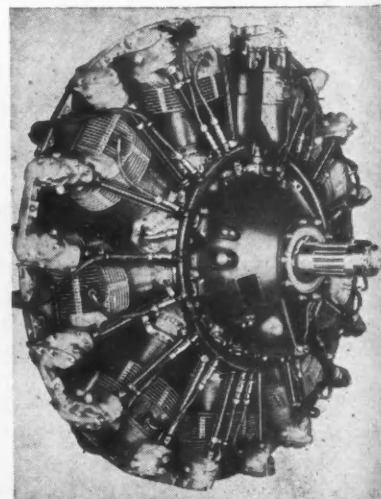
Standard aircraft instruments of the pointer-indicating type are used as sensing heads for the new recorder. Tiny electrical low-torque transmitter selsyns are installed on the instruments, and their rotors are driven by the instrument pointers. Each selsyn transmits the position of its instrument's pointer to the remotely-located recorder.

Metal inkless styli in the recorder make a continuous black trace at any altitude or temperature. The paper can be submerged in salt water for several days without damage to the record. The chart carriage holds 260 hours of chart supply at a chart speed of 2 in. per hour, and a proportional supply at other chart speeds.

The sensing heads for the recorder can be installed in any part of the plane where the desired data can be measured most easily and accurately, while allowing the recorder itself to be installed in the tail of the plane where it is least apt to be damaged. All connections between the sensing heads and recorder are electrical.

Wright Introduces New Cyclone Engine

A new 1525-hp model of the Wright Cyclone 9 aircraft engine has been added to the line of the Wright Aeronautical Corp., a division of Curtiss-Wright. Known as the Cyclone 9HE, (Turn to page 90, please)



Wright 9HE engine

To Better Reflect the Expanded Scope of
Our Operations and Products . . .

*We announce a change in
corporate name only-
from*

LADISH DROP FORGE CO.
to

LADISH CO.

CUDAHY • WISCONSIN
MILWAUKEE



TO MARK PROGRESS

the engine produces one hp for each .93 lb of weight.

It attains its high power through use of either a light-weight system of water injection or by operation on a gasoline of grade 122/145, a fuel of high "anti-knock" properties.

Designed primarily for commercial transport operations, the new engine is scheduled for use in the Curtiss-Wright CW-32, a four-engine cargo airplane capable of carrying 25,000 lb of payload 1500 miles or 20,000 lb 2500 miles.

The Cyclone 9HE is equipped with the latest type of forged aluminum alloy cylinder heads which are not only

of stronger material than the cast type formerly used but also permit deeper finning and consequent improved cooling. Cylinder barrels are cooled by "W" type aluminum alloy cooling fins tightly applied in the steel barrel. This, too, permits deeper fins and better cooling.

Only half the size of the engine's starter, the water injection system is light in weight and takes up little space. In use on an airplane, the water injection equipment is put into operation automatically by a manifold pressure regulator. Two small nozzles located just past the carburetor inject

water and alcohol in equal proportions into the mixture of fuel and air. The alcohol prevents the mixture from freezing in its tank at low temperatures from either climate or altitude.

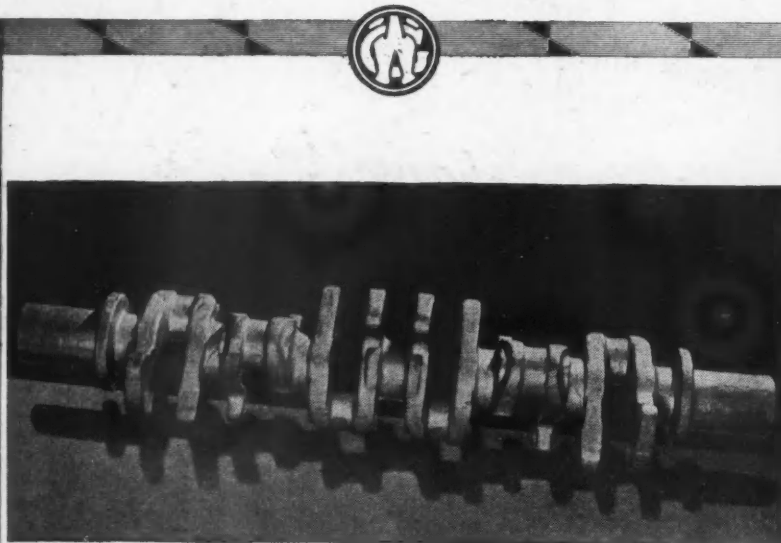
New Propeller De-Icing System for Steel and Aluminum Blades

A propeller de-icing system which is said to remove ice for an unlimited time under the most severe weather conditions has been developed by Hamilton Standard Propellers division, United Aircraft Corp. The system utilizes electrical heat and the propeller's own centrifugal force to remove ice formations. It is used internally with hollow steel blades and externally with duralumin blades. A hollow steel blade is de-iced by current applied to special-alloy heater wires cemented to the inside surface of the blade's leading edge. For duralumin blades the heating element consists of three layers of different rubber types mounted externally on the leading edge. The middle layer of conductive rubber supplies the heat by virtue of its electrical resistance; the inner layer is selected for good cementing and thermal insulation characteristics; and the outer layer is selected for smooth finish and high erosion resistance. Total thickness of the pad is approximately one-tenth of an inch. In both blade installations, the heated section covers approximately 75 per cent of the blade length and 20 per cent of the width extending from the leading edge.

Electric current for de-icing is derived from the airplane battery and generator and carried to the propeller by a slip-ring and brush system. Wires conduct the current to the heating elements on the blades. The power supply is controlled by a timing device mounted in the airplane which cycles current to each propeller in turn, thus minimizing the load on the airplane's electrical system. In this way, heat can be applied to each propeller for a 20-sec interval and shut off for 60 sec under icing conditions at moderate air temperatures. To cope with icing at very low temperatures, a double-throw switch in the cockpit permits the pilot to select a second cycle of 60 sec operation and 180 sec non-operation. The timer can also be internally adjusted to meet varying time requirements for conditions prevailing on the routes of a particular airline.

As standard equipment on Martin 202's and 303's, Hamilton Standard equipped Douglas DC-6's and Consolidated Vultee 240's, it is claimed that the new system will be used by 13 out of the nation's 16 major certificated airlines.

AUTOMOTIVE and AVIATION INDUSTRIES readers are always well informed.



OUTSTANDING EXAMPLE of modern forging technique—an inline aircraft engine crankshaft forging—a six throw, seven bearing design having twelve integrally forged counterweights. Starting as a straight bar of alloy steel, the material is successively worked through the various forging operations to produce the ultimate shape, having flow lines carefully directed to provide greatest strength in the critical sections.

Standard of the Industry for Sixty Years

WYMAN-GORDON

Forgings of Aluminum, Magnesium, Steel

WORCESTER, MASSACHUSETTS, U. S. A.

HARVEY, ILLINOIS

DETROIT, MICHIGAN



Central control station for two-zone heat-treating furnaces at Spicer Manufacturing Co., Toledo, Ohio . . . makers of Universal Joints, Clutches, Gears, etc.

FOR SMOOTH CENTRALIZED CONTROL MICROMAX Instruments Give Top Efficiency

When Spicer Mfg. Co., during expansion of its Toledo, Ohio operations, centralized control of its large carburizing, tempering, hardening and annealing furnaces, careful consideration of instruments ended in the selection of Micromax Controllers for the job, because of their dependability and convenience.

In large-scale instrumentation such as Spicer's, Micromax's always helpful self-standardizing feature is a particular asset, saving in this case about one man-hour per day. This is in addition to its fundamental advantage of maintaining the full accuracy of the potentiometer's recording and control circuits.

Among the convenience features are the cell-condition indicator and a "tell-tale" which shows whether the instrument is in service. Ink and recorder chart warn well in advance when refills are needed. To communicate other information, "bull's-eye" or other signals can be automatically operated.

In addition to the two-position motorized control which Spicer uses, Micromax instruments can give control of proportioning or program types. The roomy Micromax case allows for extra equipment required for a complex control problem. And there's a model and range of instrument to match the need in any given application.



These catalogs are sent on request, or, if you prefer, an L&N engineer will gladly call.



LEEDS & NORTHRUP COMPANY, 4966 STENTON AVE., PHILA. 44, PA.

LEEDS & NORTHRUP

MEASURING INSTRUMENTS • TELEMETERS • AUTOMATIC CONTROLS • HEAT-TREATING FURNACES

Int Ad N-33-620(10)

February 15, 1947

When writing to advertisers please mention AUTOMOTIVE and AVIATION INDUSTRIES

91

McCulloch's New Plant

(Continued from page 37)

accumulation of waste paint. The pre-heated engines dry quickly. In the process of drying, while moving along the conveyor line, the engines lose most of their heat. They are thus suitable for handling when they enter the test room.

The test room has sufficient test benches to accommodate 28 engines at one time. Engines are placed on fixtures in the bench and started by an electric motor, which can be rolled on a rail by the operator to any point over

the engine. Loading of the engines is accomplished by the use of variable-pitch propellers that can be set automatically from no-load to full-load by push buttons. Each engine is given a thorough test with varying loads. During the final test, the carburetor and governor settings are adjusted. The engine is then put back on the overhead conveyor line, and sent to the final inspection department.

Final inspection is given the engine at another spray booth, where touch-up

paint can be applied. The engines remain on the conveyor during inspection, and then travel directly to the shipping department for crating. After crating, the engines are rolled on a conveyor to the shipping dock and directly into waiting trucks.

Engine Models

Now in production at the McCulloch plant is a new line of small, lightweight, two-stroke gasoline engines in four models ranging from 2.5 hp to 4 hp for various applications in industrial, aircraft, marine, and transportation fields. In addition, the company is producing a 60 hp, two-stroke target-aircraft engine, and is currently developing a 120 hp, two-stroke, opposed piston model for aircraft and marine use. Specifications for these small engines (series 1200), and the target-aircraft engine (model 4300) are given in the accompanying table.

All major parts of the 1200 series engines, with the exception of rods, crankshafts and cylinder sleeves, are high-pressure aluminum-alloy die-castings. The improved starting and idling characteristics are said to result from two advancements in two-stroke design—a reverse-flow scavenging system; and a new oil-injection device wherein a separate injector meters the correct amount of oil for lubrication to the bearings, thus eliminating the need for mixing oil with gasoline. The reverse-flow scavenging system is a tested method of obtaining correct turbulence and distribution of incoming fuel charges by means of vaned intake ports. This system uses a flat-top piston. Anti-friction bearings are used throughout the engine.

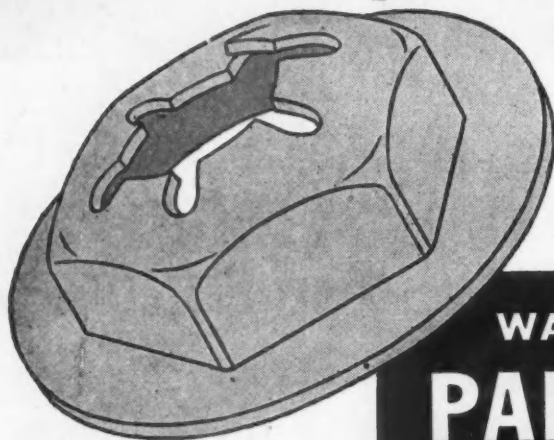
Target-Aircraft Engine

The Model 4300 target-aircraft engine features a new, miniature diaphragm fuel pump driven by a pin running on a camshaft eccentric. An injector-type regulator is used to provide proper carburetion at all altitudes. A venturi in the air scoop measures the mass flow of air, and corresponding pressures are transmitted to the regulator by synthetic rubber tubes. Fuel pressure for the regulator is supplied through a pulsator diaphragm from the pump. The magneto, built by McCulloch, utilizes an impulse coupling which provides an adequate spark during operation, and acts as an automatic retard for safer starting. As a further aid to easy starting, a priming system, consisting of a manual release on the fuel regulator, is used. As with the series 1200, flat-top pistons are used in this engine in conjunction with reverse-flow scavenging. Vaned intake ports provide the necessary loop flow without the use of deflectors. Most of the major parts of the engine are designed for die-casting.

Opposed-Piston Engine of 120 hp

The new 120 hp model currently un-
(Turn to page 94, please)

Speedy, Low Cost Fastening



OF
MOULDING STRIPS
HOOD & TRUNK
MEDALLIONS
TAIL AND
PARKING LIGHTS
ETC.

WASHER TYPE
PALNUTS

Handle **ONE** part



instead of **THREE**



THESE inexpensive one-piece, self-locking Palnuts perform the same function as regular nut, lockwasher and plain washer combined. You not only replace three parts with a single Palnut, but power drivers may be used to further speed up assembly. Special sockets for power drivers pick up, spin on and tighten Palnuts in one operation. Once

tightened, Palnuts stay tight under vibration—assured by their exclusive double locking spring action.

Send for samples. Ask for engineering literature on entire Palnut fastening line.

THE PALNUT COMPANY

60 Cordier St., Irvington 11, N. J.
Detroit Office: 3-213 General Motors Bldg.



Self-Locking PALNUTS

...planning on building a rocket ship?"

How long will it be before exploration of stellar spaces becomes practical? Ten years—fifty years—a hundred years? It is not wise to predict, particularly when we consider the advances that the past few years have brought.

But if you are developing a rocket ship, you will undoubtedly call on Foote Bros.—just as in the past manufacturers of other marvels of transportation have.

Today, Foote Bros. is producing precision gears of Aircraft Quality for many purposes where light weight, extremely high speeds, maximum efficiency, compactness and low noise level are important. Foote Bros. Power Units and Actuators provide absolute control from a remote point. These units assure accurate mounting so essential if the full benefit of "A-Q" Gears is to be realized.

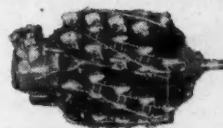
Regardless of what your requirements in power transmission may be, Foote Bros.' two large plants are ready to serve you. The Precision Gear Division has complete facilities for producing "A-Q" Gears and Power Units in quantities. The Industrial Gear Division is equipped to turn out giant gears up to 20 feet in diameter or production runs of smaller gears. This division also manufactures speed reducers in sizes and ratios to meet almost every industrial need.

FOOTE BROS. GEAR AND MACHINE CORPORATION
DEPARTMENT F, 4545 S. WESTERN BOULEVARD, CHICAGO 9, ILL.

FOOTE BROS.

Better Power Transmission Through Better Gears

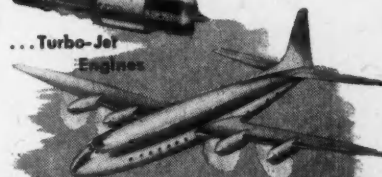
FOOTE BROS. PRODUCTS ARE USED IN MANY OF THE LATEST AIRCRAFT DEVELOPMENTS



...Pratt & Whitney Wasp Major Engine



...Turbo-Jet Engines



...such modern transports as the Lockheed Constellation



...such revolutionary developments as the Northrup Flying Wing



A recent bulletin on Power Units gives complete engineering data on "packages of power." Sent on request. Also available, a bulletin on Aircraft Quality Gears. Mail coupon.

Foote Bros. Gear and Machine Corporation
Dept. F, 4545 S. Western Boulevard, Chicago 9, Illinois
Please send me Bulletins on: ☐ Power Units ☐ Aircraft Quality Gears.

Name.....
Firm.....
Address.....
City..... State.....

der development is a three-cylinder, two-stroke, opposed-piston engine designed for aircraft and marine use. There are two crankshafts in the engine which drive a large propeller shaft through pinions located at the front end.

One piston controls the exhaust ports; the other controls the inlet ports, with the crankshafts timed so that the exhaust ports are opened in advance of the inlet ports. This permits most of the exhaust gas to escape before the fresh charge enters the combustion chamber. When the inlet port opens, the fresh charge is forced into the com-

bustion chamber by the gear-driven supercharger. While passing through the inlet port, the fresh charge is given a rotary motion, which aids in keeping the fresh charge separated from the residue of the exhaust gases. It is claimed that this arrangement has proved successful in raising the fuel economy of the new engine beyond that of conventional two-stroke engines and equaling the best four-stroke engines. The main engine structure, including the integral cylinder block, is an aluminum-alloy high-pressure die-casting. Cylinder liners are shrunk in place. For the fuel system, a fuel in-

jector discharges fuel into the inlet manifold through individual nozzles for each cylinder.

Bendix Direct Injection

(Continued from page 41)

acting on these diaphragms exactly balance each other.

The regulator also incorporates a constant head idle-spring designed to maintain a constant fuel-metering head in the idle range at low air-flows. While in the idle range, a helical spring between telescoping parts of the poppet-valve stem opens the valve to a predetermined degree until air metering force is equal to the spring force. When air metering force balances spring force, the two telescoping parts of the valve stem make solid contact and function as an integral unit in the same manner as a conventional rigid valve stem.

Metering-Jet Unit

From chamber D, fuel passes through the idle metering jet and then through the system of other metering jets. Final metered fuel then goes through the regulator fill valve, flows to chamber C, and returns to the fuel regulator by the metered fuel passage shown at the top. Metered fuel, fully compensated for specific conditions of flight finally passes through the manual mixture control valve, and is delivered to the fuel injection pump.

Portal-to-Portal Suits Delay Wage Increases

Labor unions appear to have euchered themselves into a corner on their portal-to-portal pay suits, so far as getting wage increases is concerned. The extension of the contract with U. S. Steel to April 30 was in part caused by the portal pay drive. Faced with suits running into scores of millions of dollars, the steel companies are reluctant to grant any pay increases in the face of possible heavy payments for back pay. Both sides probably will mark time until Congress takes some action in the portal-to-portal issue. The general consensus is that the whole issue will be knocked out altogether or so limited in scope that it will not amount to any great financial hardship. Another interesting development is the almost complete absence of comment by unions on the decline in several cost of living items. While costs were soaring following abandonment of price control, union propaganda played heavily on prices. Now that some foods and other items appear to be hitting the skids, nothing is heard from union headquarters.

**HERE'S HOW
YOU CAN
IMPROVE BALANCE**



The slip-on-the-transmission-shaft feature assures better balance because both **MECHANICS** Roller Bearing **UNIVERSAL JOINTS** are welded to the tubular shaft. Let our engineers show you how this and other **MECHANICS** features will give your product competitive advantages.



MECHANICS UNIVERSAL JOINT DIVISION
Borg-Warner

2020 Harrison Avenue, Rockford, Ill. Detroit Office, 7-234 G. M. Bldg.